THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCI. No. 2201.] LONDON, JULY 18, 1905. [57TH YEAR. PRICE 6d.

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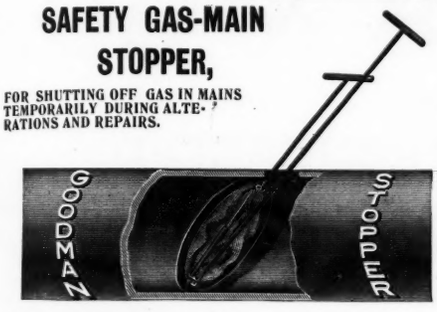

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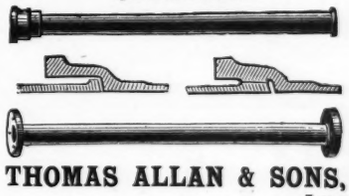

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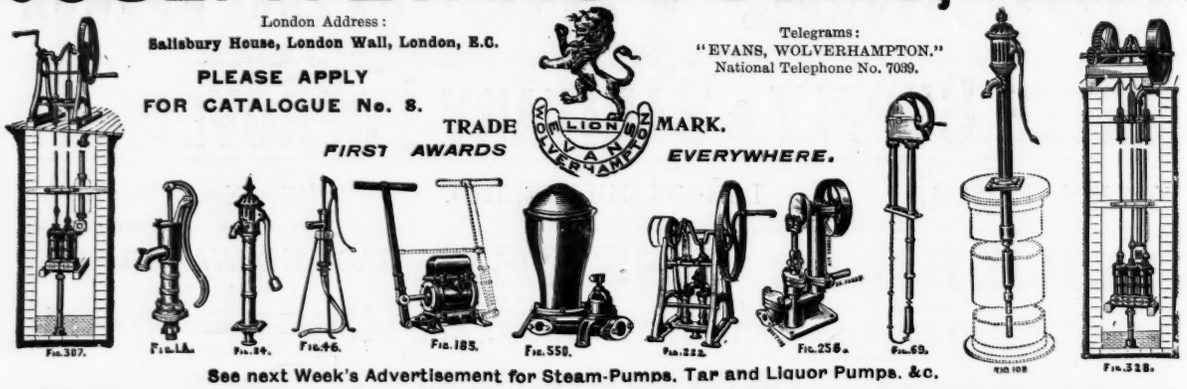

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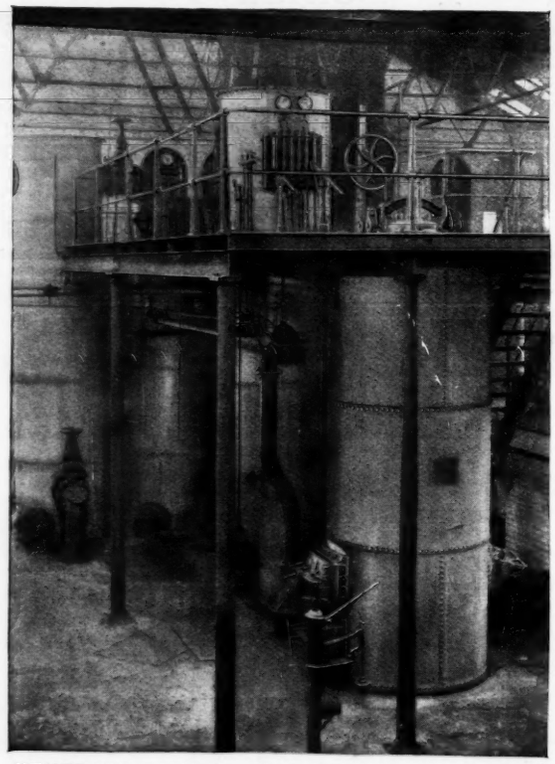

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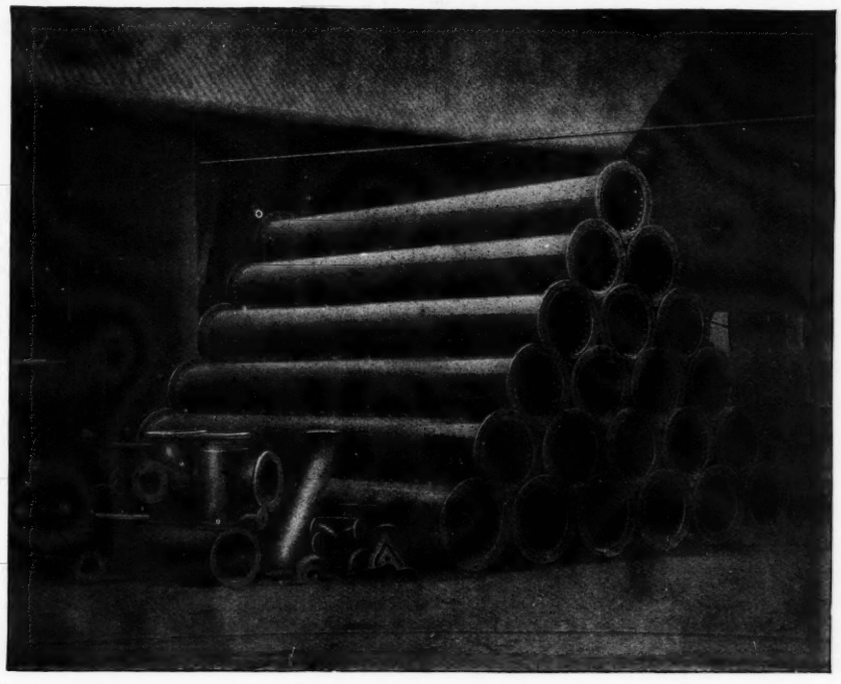

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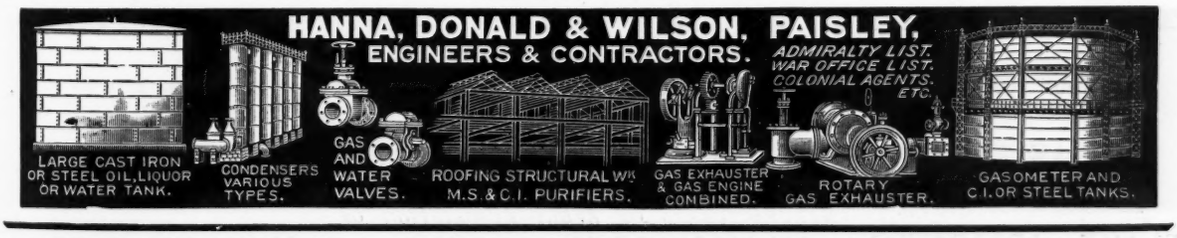
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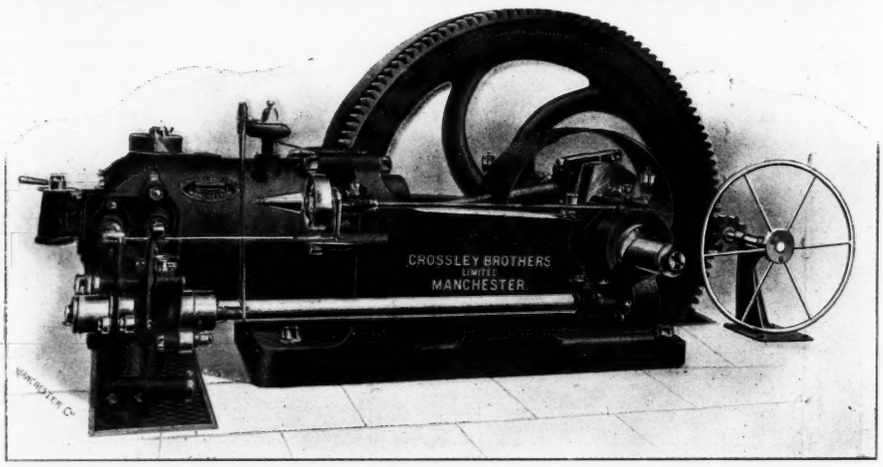

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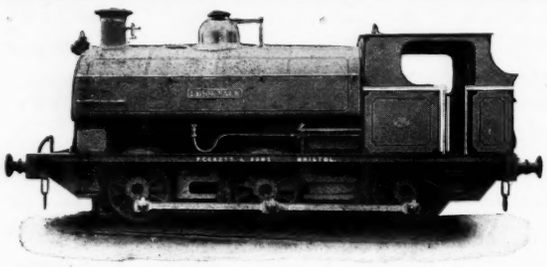

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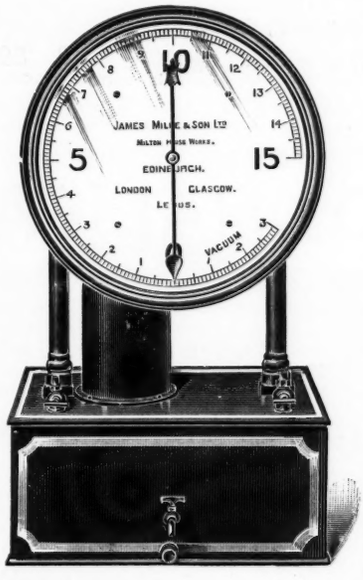

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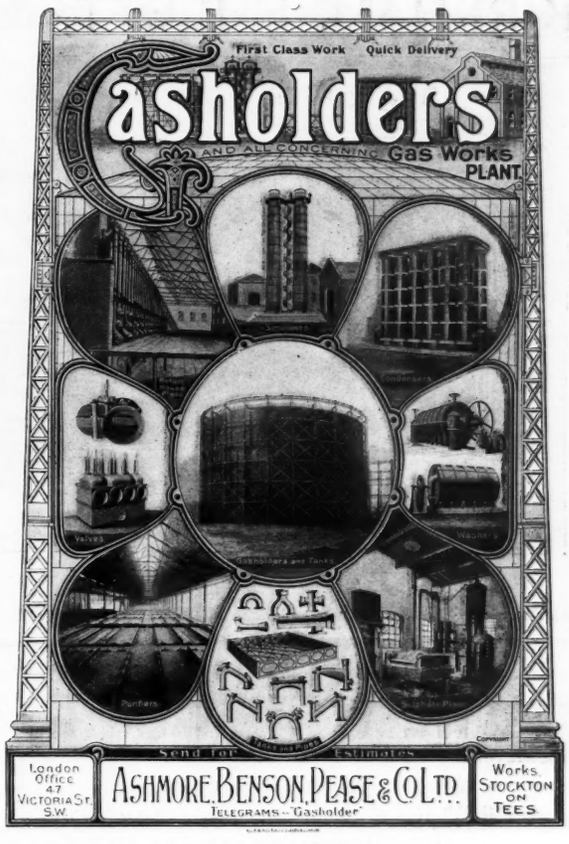

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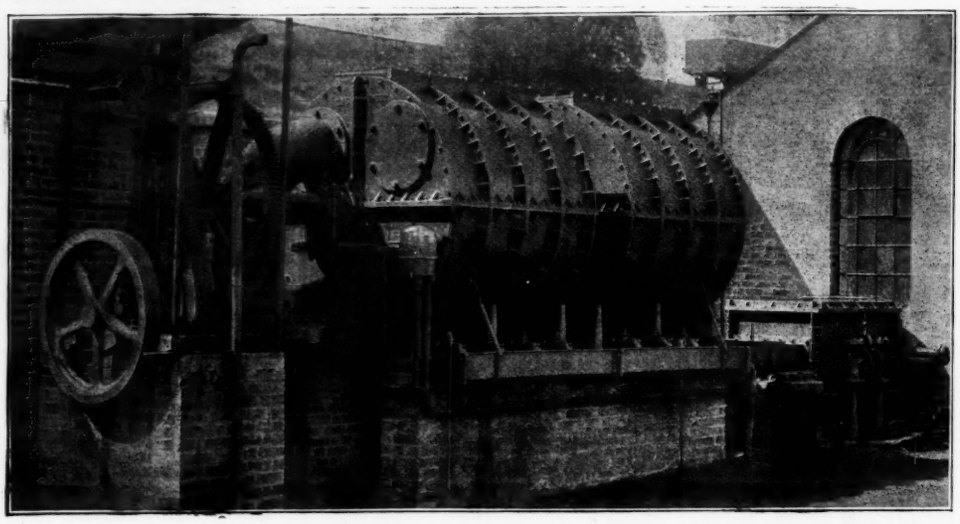

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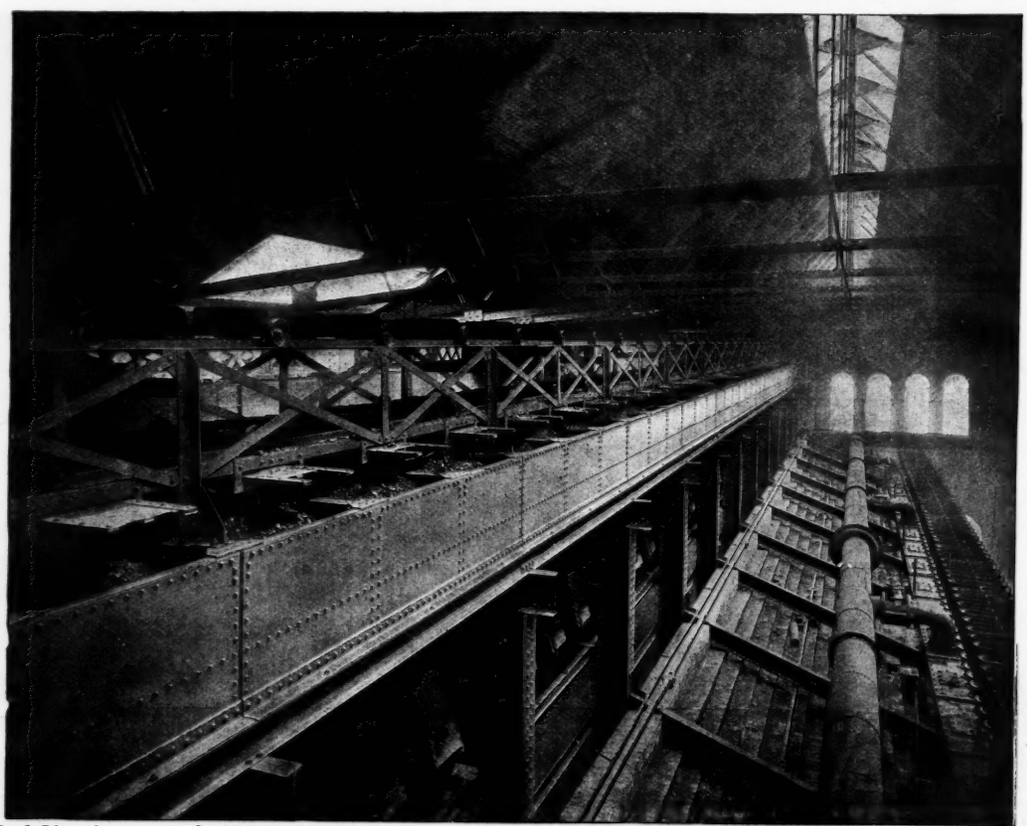

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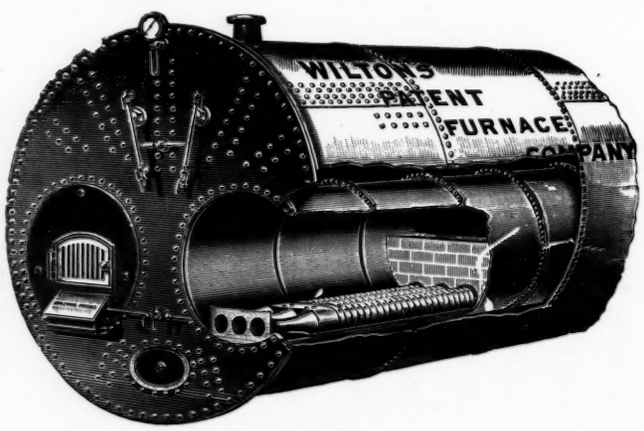

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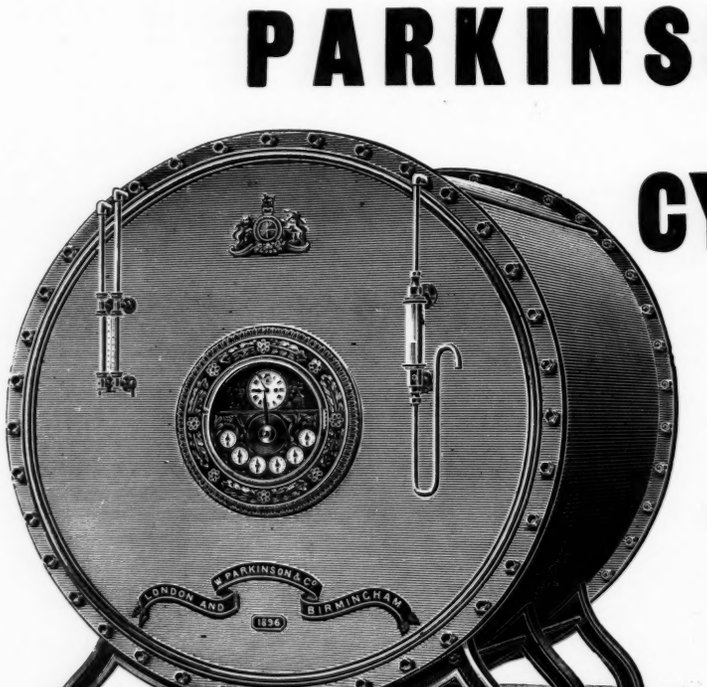

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VOL. XCI., No. 2201.—TUESDAY, JULY 18, 1905.

EDITORIAL NOTES—GAS, &c.

Engineer-Directors.

THE acceptance of a seat on the Board of the Continental Union Gas Company by Mr. A. F. Phillips (as announced last week), settles definitely and satisfactorily a recent controversy, and will, it is to be hoped, do something to restore the fallen fortunes of the Company. We have already animadverted upon the remarkable attitude taken up by the Chairman and his co-Directors on this question, and need only say further that this speedy change of front—welcome though it be—only affords another example of their vacillation. How, asked Mr. Tendron (a member of the Board), at the extraordinary meeting of the Company on the 6th of June last, could they have a stronger Board than the present one? and he then proceeded to extol the qualifications of some of his co-Directors. He had found, he continued, that it did not do at times to have technical men on a Board. They interfered far too much with the staff, and with other things. Where Mr. Tendron obtained his experience upon this question it is difficult to say, since he happens to be the only member of the Board who is not a member of some other Gas Company's Board with an engineering colleague. The Chairman (Mr. Arthur Lucas) was still more emphatic on the point. The presence, he said, of a Technical Director on a Board was a cause of constant friction, and a cause of jealousy between the engineers. So strongly did he feel with regard to this matter, that he declared that as long as he had the honour to preside over the Board, he should strenuously oppose—and it was straighter for him to say so at once——the appointment of an engineering director (because he was an engineer) on the Board. Yet a few short weeks after he thus nailed his colours to the mast, the announcement is made that Mr. Phillips, well-known and respected as a Consulting Gas Engineer, has accepted a seat on the Board; Mr. Lucas continuing to be its Chairman.

It is no doubt open to Mr. Lucas to plead, in reply, that Mr. Phillips has been appointed not merely because he is an "engineer," but because he is also a good business man and a man of affairs. So be it; and on all grounds the general opinion will be that no better choice could have been made. But such reasoning, if employed, would remind one very forcibly of the casuistic advice of the Quaker to his son: "Don't marry for money, but marry where money is;" and it would be alike unworthy of the Chairman and unjust to Mr. Phillips. There can be no doubt in the mind of anyone that Mr. Phillips's assistance has been sought and obtained because he is a gas engineer. And, however much the fact may be disguised, the Directors have, by their action in this regard, belied their utterances at the last extraordinary general meeting. Mr. Phillips's position is not one to be envied; but all the more credit will be due to him if he should succeed in restoring order out of chaos, and redeem what cannot but be regarded as the proved incompetency of his colleagues. It is to be hoped, however, that some at least of the members of the Board will recognize the advisability of retirement, in order to make room for others who are more likely than themselves to be of real assistance to Mr. Phillips in the task which he has undertaken. A Board which has developed to such a degree, as this one has, "the "almost fatal facility"—to quote the words of one of the speakers at the recent meeting—"for accepting bad advice," requires to be thoroughly reconstructed; and the sooner this operation is performed, the better will it be for the holders of shares in the concern.

So much for the Company and its affairs. It has our best wishes for a speedy return to its former condition of prosperity. But we cannot refrain, in the light of this last act of the Directors, from again expressing indignation at the remarks which were made at the extraordinary meeting referred to, on the question of the appointment of an engineer-director. If the Chairman was speaking from his own experience, real or imaginary, it is certain to have slandered one who is his colleague elsewhere, and who is above all such suspicion; if, on the other hand, he was not speaking from experience, his remarks ought never to have been uttered. As has already been stated, all except one of his colleagues sit on other Boards, on which gas engineering is represented; and that they should have acquiesced, by silence, in the Chairman's remarks apparently is not the least extraordinary part of this most extraordinary episode. We may express at once our utter disbelief that these remarks were in any sense called for, either by the exigencies of the position in which the Chairman found himself, or by any facts in this connection which were in his or the Board's possession. It is contrary to reason and to common sense that those persons only should be disqualified from the conduct of gas undertakings who understand the business which has to be carried on. The temperament of the individual, and a knowledge of affairs, no doubt count for much; but so also they do in the case of any director; and to exclude one because he happens to have technical qualifications is neither more nor less than an act of folly. There are only a few foreign gas companies managed in London which have not one or more gas engineers included in their Boards. The Continental Union Gas Company have hitherto been one of the few. Moreover, it can be easily shown that some of the most prosperous gas undertakings in the country are those which are fortunate in having technical heads, either as Chairman or Chief Officer. It may be admitted that the training and experience gained by an engineer are not always such as to make a good commercial man; but, on the other hand, most engineers—more especially those of provincial undertakings—are obliged, in the course of their duties, to deal more or less with commercial matters. So much is this the case that if there should ever be a demand for "Engineer-Chairmen of Gas Undertakings," as so fondly desired by Sir George Livesey, there will not be found wanting those to whom the fortunes of such undertakings may be safely entrusted.

Life among the Juniors.

IT is with no small degree of pride and satisfaction that we to-day survey the position of organization among the juniors for technical advancement. Early in 1902 an appeal was made in these columns—on the broad ground of the prospective welfare of an industry which deals kindly with those who in the present enjoy its fruits—to the seniors of the gas profession to take such steps as might to them appear proper to give facilities to their juniors and coming successors to obtain a greater breadth of view of the technical world in which they are destined, or are hoping, to take part. The seniors at the time did not publicly evince any particular interest in the matter; and we regret to say that an attitude of *laisser faire* was adopted by them for awhile. After that, with before us the splendid example of the organization of the Manchester juniors, who were doing vigorous work with a self-reliance which one could not but admire, an appeal was made to the juniors direct to help themselves. We do not pretend that the mild agitation which was then waged in these columns can solely claim the credit of being the incentive to the movement which has its gratifying result in the position of the affairs of the juniors to-day, and which result marks the beginning of the very state of things that it was and is believed was needful to the rounding-off, as it were, of the training and experience of the juniors who are aiming for place in the higher professional ranks.

Many prominent men had long before spoken of the need of provision for a higher technical education for the young men who entered the gas industry with the hope of official preferment; but what those prominent and far-seeing men had said had fallen on stony ground, and so did not fructify. Only in the year 1905 are the Institution of Civil Engineers taking counsel with the sister technical organizations as to the best lines of training for the juniors of engineering. The juniors of the gas industry in the Manchester District, as already gladly acknowledged, decided now some years ago among themselves that there was experience to be gained

by unity, companionship, and personal influence; and while their seniors did not collectively take any conspicuous part in the organization, they have, from the outset, individually given them every encouragement. Since those days, many of the juniors in the London and Southern District have associated themselves; then followed the Yorkshire and District Association; succeeding them came the Scottish organization with its two sections; and, lastly, the Midland Association, now well on the road to complete establishment. The Scottish organization had the advantage of the countenance in its foundation of some well-known engineers; and the Midland Junior Association is the direct offspring of the Midland senior organization—being the only one that can boast the good fortune of descent from an Association that has been for long established, and has earned an honoured position in professional history. The names of the Hon. Secretary of the Senior Association, Mr. Charles Meiklejohn, and of the President, Mr. T. Berridge, will be indissolubly bound up with the foundation of the Midland Junior Association, as well as with the successful institution of a class in "Gas Manufacture" at the Birmingham Technical Institute.

The junior organizations are strong numerically; and the reports which appear from time to time in our columns show a virility which commands respect. Mentioning the organizations in the order of their formation, it is found that the Manchester juniors have a membership of 65; the Southern, of 60; the Yorkshire, of 71; the Scottish show a remarkable development—the Western Section having a membership of 144, and the Eastern Section of 88 ordinary members; and the Midland Association have already a total of 54. Here we have an aggregate of 482 juniors who believe in organization; and they present a vital force of which the gas profession may well be proud, and to which every possible encouragement should be given. The Midland Association and their offspring are going to maintain a connecting-link; and we like the idea.

In the possession of these junior organizations, we now stand in a unique position among specialized branches of engineering. Upon the advantage that they are and will be to the members themselves, to the gas industry, and to the senior organizations, we need not again enlarge; and indeed they are obvious to anyone who gives the matter only a few minutes' serious thought. It must not, however, be forgotten by the seniors, that those who are now their juniors will have to take up the work in the higher offices of the profession where the seniors leave it. Many of those who have now the responsibility of the technical work of the industry have had the advantage of advancing, from the stage of comparatively simple practice, to the latter and greater developments of their technical and commercial work. The juniors have to begin by learning what has been gradually unfolded to their seniors, and utilizing the material liberally furnished by past experience and practice for the foundation of their work, and simultaneously absorbing the fresh growth in order that they may be fully prepared for all the future. The industry will want its strong men as much (if not more) in the time coming as in the past and present. Work has been commenced the progress of which must not be allowed to slacken if the industry is to maintain and increase its flourishing state. Therefore all who can among the seniors should look upon it as a duty they owe to the industry to do their part in inspiring further confidence and courage among the juniors who have shown such a fine spirit of self-reliance which all must admire.

The Rating of Gas-Mains.

COMMENT was made last week on the good fortune of the Metropolitan Gas Company of Melbourne before the Judicial Committee of the Privy Council with regard to the liability of their mains to be rated for sewerage purposes. The Melbourne Metropolitan Board of Works claimed to levy rates on the Company in respect of mains comprised and separately valued in the valuations of the several Municipalities within which they are respectively situated; and the question was whether, for rating purposes, they were to be treated as sewered or unsewered properties. The Board are entrusted by their constitution in 1890 with the management of the sewerage and drainage as well as the water supply; and they are authorized to levy an annual rate not exceeding 1s. in the pound. By a subsequent Act, passed in 1897, the procedure to be followed by the Board was defined. It was enacted that the Board should, after sewers had been made in any street or part of a street, cause a general notice to be given that provision had been made for sewering the property abutting on such street; and, after such time as should be fixed by the Board, the property should be deemed and taken to be a "sewered property." It was also provided that every property (whether or not abutting as described) which should be connected with any sewer of the Board, should be deemed to be a sewered property; and upon such property the Board were empowered to levy a rate, for nine years after the commencement of the Act, at 1s. in the pound of the net annual value of the property, and thereafter a rate not exceeding this particular amount. A rate of 1d. or 2d. in the pound was also to be levied during the nine years on all unsewered property, after which, however, no rate was to be levied upon it.

The claim of the Board was to enforce rates levied on the Company in respect of their mains within the Metropolis, treating them as sewered properties wherever they issued from, and were connected with, a property of the Company coming under the definition of "sewered property." The Company, on the other hand, contended that the mains were not liable to the Metropolitan general rate, and that if otherwise, they were not liable to be rated as sewered properties. Mr. Justice Williams, in the Court of First Instance, gave judgment for the Board, holding that the mains being connected with the works or gasholders of the Company, and forming part of the general undertaking, were necessarily connected with the sewers of the Board. On appeal the Full Court decided that, inasmuch as gas-mains were not capable of being sewered, they were not liable to be rated at all. Such was the position of the case when it came before the Judicial Committee of the Privy Council. Lord Macnaghten, in delivering their Lordships' judgment, said it appeared to them that the subject liable to be rated was not the undertaking of the Company, but the properties comprised in the Municipal valuations which the Metropolitan Board were bound to adopt, and that these properties were not liable to be rated as sewered properties unless they fell within the definition of such property contained in the Act of 1897. They therefore agreed with the Full Court that the mains were not sewered properties, inasmuch as they did not abut on a street or part of a street in which sewers had been laid. Since, however, they were not sewered property, they came under the head of "unsewered" property, and the circumstance that they were not in their nature capable of deriving from sewers the same benefit as habitations, was not a sufficient reason for placing them in a new category not contemplated by the Act. The result is that the gas-mains will be rated for nine years at 1d. or 2d. in the pound according to their position; and at the expiration of that time they will be altogether free from rating for sewerage purposes.

Attention is called to this case because it is clearly one in which the principle of differential rating—recently much discussed in this country—is fully recognized. Gas-mains derive no benefit from sewers; therefore they are not to be rated for sewerage purposes. Neither do gas-mains in this country derive any benefit from sewers, or from public libraries, baths, and washhouses, and a multiplicity of modern requirements for which nevertheless they pay rates. They may even have to contribute towards maintaining the electric light cables which run alongside them. The suggestion that they should be exempt from all special rating —such as sewerage, education, &c.—has common sense to recommend it, and will, it is hoped, enlist the sympathy and active support of all who are dissatisfied (and who are not?) with the present system of rating.

The Devonport Decision.

The Devonport Town Council have put an end to the vexed question of "blue" *v.* carburetted water gas by adopting the recommendation of their present Gas Engineer, Mr. J. W. Buckley, in favour of the latter system. It is to be hoped, for the credit of all concerned, that the controversy will now be considered as settled. Both the Gas Engineer and the Chairman of the Committee laid emphasis on the point that, in the latest phase of the subject, the initiative has been taken by the Engineer. There has been considerable modification of the original estimate of the cost; and the tender of Messrs. S. Cutler and Sons, now accepted,

represents a marked saving of capital expenditure as compared with what was formerly intended to be spent. This change is due, in part, to the selection of a site which Mr. Buckley considered more suitable than the one originally proposed, and to the substitution of steel buildings for the more expensive structures of stone and brick originally designed. For all this, Mr. Buckley is responsible. A noteworthy feature of the discussion upon the subject was that each party in the Council was anxious to claim credit for the saving which had been effected. There was a good deal of acrimony in the tone of some of the speeches; but the Mayor's firm ruling that references to the recent law suits would be out of order, and the wisdom of the Chairman of the Gas Committee, in declining to be drawn into a speech on the subject, kept the controversy within reasonable limits. Some of the things which were said do not augur particularly well for the future. The gas undertaking is not unlikely to find the next few years a period of some stress and difficulty. If the gloomy prognostications which are just now indulged in in some quarters are fulfilled, the trade of the Dockyard towns will show a considerable falling off as the result of recent changes of naval policy. Already large numbers of men have been discharged from the Devonport Dockyard; and as there is no great industrial enterprise in the neighbourhood to utilize their services, they are likely to migrate to other localities. While this may cause a check in the rate of increased consumption of gas, there is the certainty of an absolute decrease in the consumption because of the use of electricity instead of gas for lighting and other purposes in the Dockyard. The gas undertaking will, no doubt, adapt itself in time to these changing conditions. Meanwhile, the position is one calling for co-operation, and for a combined effort to overcome any temporary difficulties which may present themselves. This view does not, however, seem to have manifested itself to the members of the Devonport Town Council. Some of these gentlemen appear incapable of realizing that, in the carrying on of a commercial and industrial undertaking, there is more to be considered than the private and political animosities of individuals. Those who have been quarrelling so fiercely over the merits of water-gas systems may regard it as a coincidence that at the very time when Devonport has finally decided upon the adoption of carburetted water gas, another town at the opposite extremity of the county of Devon has inaugurated a "blue" water-gas plant. Comparisons between the carburetted plant at Devonport and the Dellwik-Fleischer plant at Ilfracombe will not be easy, because of the difference of circumstances; but it is certainly noteworthy that the latest developments in Devonshire bring both systems into use.

Corporation Gas Undertakings.

A glance through the results of the working of corporation gas departments during the past financial year which are noticed to-day reveals some very interesting points—though decreased consumption is again somewhat too much in evidence. However, there are sufficient reasons for this temporary check. As regards residuals, of course, the experience nearly everywhere has been the same—a heavy falling off in receipts. From Carlisle comes the announcement of a record year as regards profit, though the consumption of gas shows a sensible diminution. Large consumers have adopted electricity; while the presence of the incandescent burner, too, has made itself felt. There was also the fall in the value of residuals to be reckoned with; but though this represented over £2000, the Committee were lucky enough to be able to save the whole of it, and more besides, on their purchases of coal and oil—the whole of the credit for which the Chairman graciously acknowledged was due to the Manager, Mr. W. J. Smith. Somewhat tardily, the conclusion appears to have been come to that Carlisle is not large enough to run successfully both a gas and an electricity supply, as "one or both must suffer." In the case of Carlisle, as elsewhere, the major part at any rate of the suffering is experienced by the Electricity Department, the current apparently having being sold at a loss for the purpose of attracting the custom of the large gas consumers, much in the same way as a correspondent to the local Press (whose letter is reproduced in another column) points out has been done at Coventry. It will be seen that rather more than 26 per cent. of the total make was water gas. The outstanding feature in the balance-sheets of the Goole gas undertaking for the past two years has been the very low net cost per 1000 cubic feet of gas in the holders, including all the manufacturing charges —*i.e.*, coal (less residuals), purification, wages, and maintenance. The figure last year was 6·61d., and in the previous year 6·29d. In 1902-3 the cost was 13·15d.; so that a most satisfactory reduction has been effected in this direction. The receipts were a good deal less last year, owing to a smaller consumption, the familiar drop in residuals, and a reduction of 2d. per 1000 cubic feet in price. The undertaking is, however, in a sound financial position, and a wise course has been adopted in permitting the consumers to have a share in the prosperity.

The gross profit at Ramsgate is the second largest experienced in the history of the undertaking; and it would have taken first place had it not been for the inclusion under repairs of works of a large proportion of the cost of a new retort-bench. There is certainly good ground for considering this result satisfactory, especially having regard to the fact that last year coal cost £2000 more than was the case in the record year. Receipts from gas were a few pounds smaller than a year ago, and residuals also realized less favourable prices; but, on the other hand, the make was increased by 120 cubic feet per ton, and the price paid for coal was somewhat less. Since the gas-works were purchased in 1877, the price of gas has been reduced from 4s. 6d. to 2s. 8d. per 1000 cubic feet; and £41,207 has been taken from profits in relief of the rates. With a somewhat smaller make, Tipton secured an increased revenue from sales of gas; the result having been arrived at by means of a reduction in the percentage of unaccounted-for gas. Residuals do not show any falling off; a bigger return from coke more than counterbalancing the reductions in the other items. The outcome is therefore a gross profit of £6884, or some £700 more than for the preceding year, and a net surplus of £2078. The proportion of water-gas to the total make last year was only 3·68 per cent., or less than half what it was for the previous twelve months. A very small reduction in the quantity of gas sold is reported from Wigan; but there have been other matters which have operated adversely on the profit realized. The fall in the value of coke and tar and a very heavy increase in rates are responsible for a reduction in revenue of nearly £5000; and besides this there is a reduction of 2d. per 1000 cubic feet in the price of gas to be taken into account. Perhaps the most gratifying feature is the large increase that took place last year in the number of consumers—11·88 per cent. Taken separately, the ordinary consumers showed a growth of nearly 2 per cent.; while the addition to the number of users of prepayment meters was not far short of 50 per cent.

Rochdale and its Lighting Consumers.

The Rochdale Town Council have been discussing a matter of the greatest importance to the large trading undertaking of which they have charge, as well as to the citizens as individuals —namely, the price of gas. The Gas Committee had recommended a substantial reduction in the rate for lighting—3d. per 1000 cubic feet—as well as liberal concessions to users for other purposes; but notwithstanding the overwhelming nature of the arguments adduced in favour of the adoption of this course, only the latter part of the proposal was agreed to. It is not the least of the drawbacks to the system of taking from trading concerns huge profits for the "relief of the rates" that the practice, once adopted, is difficult to drop. Thus Gas Committees are liable to find themselves obliged to continue to levy charges which may, owing to altered circumstances, militate against the interests of their undertaking—simply because any change in the downward direction might make it necessary for the local authority to collect a larger sum in the shape of general rates. This seems to be very much what has happened at Rochdale, where the consumers of gas are condemned to pay a totally unnecessary amount for their light because the Corporation have unexpectedly been called upon to carry out some sewerage work which has not been allowed for in the current year's estimates. Since the works have been in the hands of the Corporation, the consumers have contributed close upon £400,000 to the local exchequer; while the net profit per 1000 cubic feet sold last year was nearly 9½d. It cannot be denied, therefore, that justice was on the side of those who advocated an all-round reduction. But this was not all; there was

an even stronger argument on the same side—that of expediency. The main object of the proposal, it was stated, was that they should be enabled to meet competition "already at their doors." So far as the use of gas for power purposes is concerned, the Committee will find themselves in a better position to do this with the lower charges now sanctioned; and no doubt it is in this direction that the competition is most threatening. The unhappy lighting consumer is to get no relief, presumably because there is no other form of gas to which he can turn. This is so great a pity, that one could almost wish the competition hinted at did not refer only to power. As it is, the consumption of gas for lighting purposes is not increasing—owing, it is argued, to the high price charged; but this fact is not enough to move the Rochdale Town Council. A good thumping decrease is what is wanted to make them properly appreciate the unwisdom of their present policy; but to lower the price when matters had reached this stage would be just about on a par with locking the stable-door after the steed had gone. At any rate, it is much easier to retain custom than to recover it when once it has been lost. Of course, there is the old argument that it is unfair to gas consumers that they should be called upon, by reducing the rates, to relieve the burdens of non-consumers; but if all other considerations failed, it could hardly be expected that this would influence the majority of the Council. It is to be hoped that next year the matter will be regarded in a broader spirit, and that the claims of the users of gas for illumination will be acknowledged by means of a substantial reduction. A cheap gas supply for lighting will not only benefit existing consumers, but (the opinion of Alderman Cunliffe notwithstanding) it will form a strong inducement to capitalists to start factories in the district. As one of the members truly remarked, "A man who asks only about rates, sees only with one eye; the price of gas is an important consideration."

Informing Councillors and Consumers.

Longton, among other places, has adopted the plan of endeavouring to make the process of gas manufacture more generally understood than it has been in the past, by arranging visits of inspection. As is recorded elsewhere in to-day's issue, the members of the Council—or such of them as were able to be present—received a "coaching" last week; and an invitation was issued to the ratepayers to make a similar visit to-day. It seems that when the Longton councillors are in an aggressive mood, they exhibit a tendency to "go" for the Gas and Electricity Committee; and the "Staffordshire Sentinel" explains that, "like the noisy shareholders in a company meeting, the critics have occasionally been charged with a scant knowledge of the subject or system they have attacked." And it was with the view to removing any grounds for this impeachment in the future, and to give their colleagues an opportunity of a closer acquaintance with the works, that the Committee arranged for the visit referred to. The idea is a good one; and it is only reasonable to suppose that both councillors and ratepayers would jump at the opportunity thus offered of increasing their knowledge in regard to so important a branch of the Corporation business. But whatever may be the results from the point of view mentioned, we are pleased to notice that the official inspection was made the occasion for acknowledging the great services rendered to the undertaking by the Engineer and Manager, Mr. W. Langford. Many were the compliments paid to him and to his staff; and the satisfaction of the recipients of these tributes cannot have been the less because they were so well deserved. Mr. Langford has just completed six busy and anxious years' service under the Corporation, during which time many extensions and alterations have been effected; but much as he has already accomplished, he will doubtless be stimulated to still further endeavours in the future by the feeling that what he does is so thoroughly appreciated by the Corporation. The wisdom and justice displayed by the members of the Longton Town Council will thus not be without effect upon the continued success of the gas undertaking.

The Midland Junior Gas Engineering Association.

The younger men who are connected with the gas undertakings of the Midland Counties are fortunate; for the two schemes which have been promoted for their benefit have been brought to an eminently successful conclusion. The formation of a Junior Gas Association we were able to chronicle a fortnight ago; and since then Mr. T. Berridge, of Leamington (to whose efforts so much that has been accomplished is due), has been able to announce the fixing up of a course of lectures on "Gas Manufacture" during the winter months at the Birmingham Technical School. As something like seventy promises to join these classes have already been received, the success of the innovation would seem to be assured. Turning to the Junior Association again, it will be seen from the report of the meeting which appears on another page that the officers have been elected, and everything is now in full working order. We feel sure that the members are to be congratulated on the selections made, and shall look forward with confidence to the first business meeting, which will take place in October. The Honorary Secretary and Treasurer (Mr. J. Hewitt) has none too long a time in which to prepare his programme for the winter session; but members have it in their power to greatly lessen his worry and work by promptly responding to his appeal for papers. Before leaving the Association for the present, there is just one word we should like to say, and that is with reference to a remark made by the newly-elected President, Mr. F. J. Bywater, that he hoped the outside members would not think the Birmingham men were taking too much of a hand in the management of the Association. It would be a thousand pities if any such foolish feeling as this were allowed to creep in at the very start of the Association's existence; and if anyone does harbour such an idea somewhere at the back of his head, it is to be hoped he will get rid of it at once. It must be remembered, of course, that Birmingham has furnished a very large proportion of the members, and, also, as was pointed out at the meeting, that it is the centre of the district which the Association covers. The hearty co-operation of everyone concerned is needed if the movement is to be a real success; and this will be impossible if any misunderstanding is permitted to arise. The members must see to it that by their conduct of affairs they fully justify the efforts of Mr. Berridge, Mr. Meiklejohn, and the members of the Midland Association generally on their behalf.

The James Keith and Blackman Company, Limited, of Farringdon Avenue, E.C., write saying that they have now received from Mr. F. Sumner, the City Engineer, the official order to commence the work of converting the lighting of Queen Victoria Street and a portion of Queen Street from electricity to gas on their system of high pressure.

The Council of the Society of Arts attended at Marlborough House on Wednesday week, when H.R.H. the Prince of Wales, the President of the Society, presented the Albert Medal for 1904 and for 1905. The latter, as already announced in the "JOURNAL," was awarded to Lord Rayleigh, O.M., F.R.S., the Chief Gas Examiner for the Metropolis, "in recognition of the influence which his researches, directed to the increase of scientific knowledge, have had upon industrial progress, by facilitating, amongst other scientific applications, the provision of accurate electrical standards, the production of improved lenses, and the development of apparatus for sound signalling at sea."

An important step in the direction of the adoption by this country of a decimal system of weights and measures has been taken by the Board of Trade. Sir Edward Fithian, the Secretary of the Association of Chambers of Commerce, sent a resolution of the Association asking the Board of Trade to authorize weights of 20 lbs., 10 lbs., and 5 lbs. as aliquot parts of the cental. Lord Salisbury has replied that the Board of Trade, having given careful consideration to the representations made, are prepared to assent to the application. Steps will therefore be taken for the preparation of standards of the same octagonal form as the present 50 lb. weight. The Chambers consider that this concession will save time, labour, and expense, as the 50 lb. weight has already done.

The ozonizing plant of De Frise, erected on the grounds of the Saint-Maur pumping-station, treats filtered water of the River Marne. It is capable of sterilizing 33,000 gallons of water per hour. The necessary force is supplied by a 45-horse power semi-portable steam-engine, driving 110-volt Mordey alternators and a centrifugal pump. A transformer capable of raising the pressure to a maximum of 80,000 volts is used, each ozonizer requiring a pressure above 20,000 volts. An ozonizer consists of a horizontal brass half-cylindrical trough fitted with a plate-glass cover and a cast-iron water-jacket. The trough is earthed, and forms one pole. Across the trough, at regular distances, are brass half discs, with serrated circular edges, 2½ inches smaller in diameter than the trough. These are fixed to the glass lid by means of screws which bring the high-tension current from the liquid resistances fitted to each half disc. For resistances, vertical glass tubes filled with a suitable liquid are used.

NOTES FROM WESTMINSTER.

The London Electric Power Bills.

Fascination and illusion over the Administrative County of London Electricity Supply Bill—or perhaps something other than fascination and illusion—continue to move all sorts of people to give this Company's scheme their most ardent support; and during the week there has been no lack of the sensational puff in the columns of the newspapers to which we have become accustomed since the promoters of the project gave it publicity. The promoters of the Bill are seventy in number; and it is amusing—though it may not be to some of these gentlemen themselves—to see the way the more prominent of them have their names on every conceivable occasion hoisted up for public admiration by those who are really pulling the ropes. "Let it go abroad that Lord Armstrong, Sir A. Noble, Sir G. Goldie, Mr. Hambro, M.P., Sir James Joicey, M.P., and Sir T. Richardson are identifying themselves with this scheme, and all will be well with us," is in effect what those who keep themselves rather more behind the scenes are manifestly constantly urging. Some of them without doubt are fine names to conjure with; but though their owners are men of business experience and financial capacity, they are also men who are not averse to some amount of business speculation, and the making of profit. But it does not follow that because of this—they being rich and liking venture—it is altogether safe to place too much value upon the attachment of their names to the promotion of such a scheme. It must become a little monotonous, if not vexing, to them to see their names trotted out so frequently as the chief among the promoters.

Power in London and Prices.

There is one thing that the promotion of this Bill has produced that is of interest to engineers; and it is the information as to the quantity of power that is in use in London for manufacturing purposes. It was brought out in succinct form in the opening speech by Mr. Fitzgerald, K.C., when the Bill came before Sir James Kitson's Committee last Thursday. According to the figures given in his opening speech, London has 500,000 persons employed in factories in the area proposed to be served. Within that area is installed machinery equal to 456,000-horse power; but only 4 per cent. of that, or 16,176-horse power, is supplied by the existing electricity undertakings. This fact, of course, is put down as the result of the present price of electricity for motive power averaging in London about 2d. per unit; whereas, under the Bill, which (if full credit is given to all that is stated) is to change all things, the ordinary ten-hours-a-day user will get his electricity at ¾d. per unit; and, in the most unfavourable cases, at 1½d. per unit. It is marvellous to hear the tall talk we are getting about what the promoters are going to do. Perhaps the explanation is the one that Mr. John Burns gave, that the scheme was manufactured in America. But why the promoters should be able to do anything better than the present suppliers who have large capitals to defend, if these suppliers were given the same opportunities as the promoters are asking for, cannot easily be seen. The present suppliers are inhibited from association in the matter of supply; but all disabilities of the kind are removable by Parliament. There are no less than forty petitioners against the Bill—companies and municipal authorities combined. We hope they will succeed; for, if an electricity supply in bulk or for power purposes is required in London, it is only just that the existing suppliers should be given first chance by an extension of their powers. Next to them we should have preference for the Administrative Company; for better them than that the County Council should be allowed to run loose in such speculation.

A Purchase Clause.

The promoters and the Board of Trade think the existing suppliers are sufficiently protected by the clauses which were arranged to be inserted in the Bill by Lord Camperdown's Committee; but it is being generally acknowledged that the protection is of a very doubtful order. On second reading, too, the promise was made that a purchase clause should be inserted in the Bill, so as to remove another disadvantage from which the present undertakings would suffer in competition with the new company. By Friday, there was no sign of any clause being brought up by the promoters; and there is no question that their little ruse was to delay its appearance in order that its discussion should be reduced to the finest limits. The Committee, however, stepped in; and required that, if possible, the clause be submitted at yesterday's sitting—anyway before the examination of the first witness (Mr. Merz) is finished.

Southport Water.

In the House of Commons, the St. Helens Corporation appeared as they did in the Lords against the Bill promoted by the Southport, Birkdale, and West Lancashire Water Board; and discussion between the parties ran high. Briefly stated, the Bill proposes the sinking of a well and the construction of a pumping-station at Bickerstaffe, on land of which Lord Derby is the owner; his Lordship having given his consent to the Bill, on the promoters agreeing to supply 40,000 gallons of water per day to Bickerstaffe. The St. Helens Corporation were solicitous for the safety of the supply from their wells at Melling and Kirkby; and they reckon that their present water resources are only equal to the growth of the demand in the next ten years. A considerable amount of feeling was imported into the case; and the volume of expert contradiction was great. Mr. Balfour Browne was sadly vexed; and with some exhibition of animation, he declared that certain of the evidence against the Bill was "a disgraceful attempt to hoodwink the Committee." It was really too fine for description to hear Mr. Wedderburn, K.C., above all practitioners at the Parliamentary Bar, counselling Mr. Balfour Browne to control his feelings. These, however, are of the little passages that add to the interest of parliamentary work. The Bill went through safely; the only stipulation imposed by the Committee being that a clause should be inserted agreeing that the adits and tunnels of the new Bickerstaffe station should not extend within two miles of any existing water-works belonging to the St. Helens Corporation.

ELECTRIC LIGHTING MEMORANDA.

The Electricity Prepayment System—Wanted, a Perfect Meter—The Working Man's Dear Light—Damages for Fire Caused by Electricity—The Loan for Dublin—An Inimical Vote for Mr. Hammond—New Convictions in the Sudbury Town Council.

THERE are indefinite terms such as "extensive," "considerable," "large number," and so forth to which different people apply very diverse measures. Everyone, of course, is perfectly at liberty to do so, only that the application of such terms to numbers and areas is apt to be (not knowing how they are regarded by the user) misleading to people whose quantitative views do not coincide with their own. We read, for instance, in an article in an estimable electrical contemporary a few weeks since, that "of late years the prepayment meter has come very much to the front, and is being used extensively." Of course, reference there was being made to electricity prepayment meters; but when the available records are examined, we cannot imagine where the writer of those words found the justification for the employment of the term "extensively." But perhaps this failure to appreciate the author's statement is due to the fact that we are accustomed to applying such terms to the use of prepayment gas-meters, in which case in all towns the numbers supply a real justification. We turn to a paper on this subject read before the Incorporated Municipal Electrical Association, by Mr. Alfred R. Sillar, the Electrical Engineer of Colchester. Discussing the classes of property in which prepayment electricity meters find favour, he states that the canvass of a road with fairly new property (of from five to ten years' standing), renting at about 7s. a week clear, will bring an application from "nearly every other house;" and he also finds that a "large number" of labourers, warehousemen, &c., earning not more than £1 a week, avail themselves of a supply. This is all somewhat astonishing; but the astonishment is only a transient matter—for towards the end of the paper, it is found that the total number of prepayment consumer in Colchester has only reached a total of 82, with an average of 5·14 incandescent electric lamps, or, converted into the equivalent of 8-candle power lamps, 8·11. We think we shall not be far wrong if we give the Colchester Gas Company credit for having prepayment consumers to the extent of a number not greatly remote from 1500. However, this illustrates what we mean by different people giving different measures to such indefinite terms as those found in the article and paper.

Mr. Sillar's paper must not be left here; for there are a few suggestions in it worth notice by those who have electricity prepayment meters and free-wiring offering fight among that section of the community whose purchases are made in small quantities. It is not surprising to find that electrical engineers themselves are not particularly infatuated over this system of supply; this statement being borne out both by an inquiry that has been instituted by the Chief Electrical Engineer of Woolwich and by the discussion on Mr. Sillar's paper. Making observations from an outside standpoint, the reasons for this are two—that electrical slot meters are not yet perfect mechanical devices, and that the results electrical engineers have secured from the system are not financially robust. Meters are expensive, cost of installation large, and the current absorbed by three or four lamps of 8 or 16 candle power in a workman's house, taken at a pennyworth a time, does not produce a magnificent income. Why Mr. Sillar himself, strong advocate that he clearly is of the prepayment system of electricity supply, states that "a large number of defects are continually showing themselves in the present designs of slot meters;" and he believes it will be "some years before the manufacturers will properly perfect them." The meters that are nearest reliability, are those whose price is the longest. We have, again, Mr. Boot, the Engineer of the Tunbridge Wells Corporation electricity undertaking (over which by-the-by there is another agitation for lifting its burden from the ratepayers by the transfer of the concern from municipal ownership), saying that he has been unsuccessful with slot meters, and many that he has bought have not even been allowed to leave his testing-room. Meters which electrical engineers cannot themselves depend upon ought not to be made use of as arbiters in the business transactions between the undertaking and the poorest class of consumer; and further we cannot think working men will be so improvident as to have any considerable business relations with purveyors of such an expensive article.

Gas can offer the working man service in more ways than lighting at a reasonable price; and, for lighting, at a price that cannot be approached by electricity. Mr. Sillar tells us that he fits up four lights in residential premises under the prepayment system—one 8-candle

power lamp in the hall, one 16-candle power in the front room, one 16-candle lamp in the back room, and one 8-candle lamp in the kitchen. What a little light the electrical engineer thinks sufficient for the poor householder and his family! Anything appears good enough for them. All Mr. Sillar asks is that the poor man may be fool enough to pay a penny for a 16-candle light for three hours, and a penny for an 8-candle power lamp for 5½ hours. For a penny and an incandescent gas-burner, the working man can actually get a 50-candle (not a nominal 16-candle) power light for at least seven hours (not three)—three times the light for more than twice the number of hours; or if he likes, he can go in for smaller burners, and spread the lighting over a longer period. If further lights are required by the prepayment electricity consumer than those mentioned by Mr. Sillar, the unfortunate user must pay an additional 8s. for each one. We do not despair of such competition as this having much (if any) effect on the flourishing prepayment gas system.

It is a satisfaction to find that the Court of Appeal have answered the Mayor and Corporation of Manchester in the case of Midwood and Company, Limited, against themselves precisely in the manner that most people expected. It is out of all reason to suppose that even the Manchester Corporation (who have had no small amount of trouble in this regard) are to be allowed to have electricity fusing cables, generating gas, leaking, and producing explosions, without making them liable for the consequent damage. In this particular case (which was first noticed at the end of March), Messrs. Midwood and Co. sought to recover an agreed sum of £677 4s. 6d. in respect of damages sustained by them through a fire, brought about from the fusing of one of the Corporation electric cables. The cable was laid in bitumen; and the fusing of the wire caused inflammable gas to be generated from the latter, resulting in an explosion and fire. Mr. Justice Lawrance and a Special Jury declared in favour of the plaintiffs; and the Court of Appeal have upheld the judgment. In other words, they have told the Electricity Department of the Manchester Corporation that they are not privileged to do things that other people are not permitted to do. It is an important judgment; and the Corporation will not find it has in any way eased the making of settlements, as hitherto have been rather frequent when it has been proved that the damage arose from the electrical system. Knowing that the law is on their side, people will want in future to be recompensed to the last penny; and who can blame them?

Touching our remarks of last week on the electrical affairs of Dublin, the Electric Lighting Committee, at the adjourned meeting of the Council, got through their proposal for an application for the comprehensive loan of £100,000. When the matter first saw daylight, the Committee stated that the money would only require to be borrowed from time to time. It now seems that no less than £60,000 will have to be brought into hand almost directly after the sanction of the Local Government Board is obtained; for no less than £13,000 is required for wiping off the balance of the original extension, and £47,000 for carrying the department over "immediately pressing work." Some of the members of the Electric Lighting Committee are still—publicly—gleefully rubbing their hands over the "success" of the undertaking; but the ratepayers must wonder when the capital absorbing capacity of the undertaking will be satisfied—anyway for a time. That time is not yet. Associated with this new loan is another of a personal nature. It seems that Mr. Robert Hammond has not so many friends outside the Electricity Committee, but within the Council, as it would have been convenient to have had to get through the new arrangement which the Committee were endeavouring to effect in pursuance of an undertaking with that gentleman. It was a kind of please-both-parties-if-we-can proposal; but one of the parties would not be pleased. The Committee were suggesting that the electricity works' extensions under the new loan should be carried out by the City Electrical Engineer, with power to call in Mr. Hammond for consultation purposes at certain specified fees, and not on 5 per cent. commission terms. There was objection to this arrangement; and a plain amendment that the work should be carried out by the department's own staff and the City Electrical Engineer alone, was endorsed by 23 members, while only 15 could be found who were friendlily disposed towards Mr. Hammond. There was consequently a modification in the report (which that gentleman will not appreciate) before it was passed.

The wisest thing the Sudbury (Suffolk) Town Council have yet done in connection with the question of adopting electric lighting in the borough was when they decided to lay a case before Mr. C. A. Cripps, K.C., for his opinion as to the advisability of appealing against the judgment in the action in which the Corporation have been engaged with the Empire Electric Lighting Company, and from which the Corporation had emerged second best. It will be remembered that the gentleman of the local newspaper who sits in judgment on everybody—from Governmental departments and Judges of the High Court down to people who are constantly studying such special questions as those involved in the Sudbury electric lighting proposals—waxed very wrath with us for daring to comment upon the position in which the Corporation found themselves; and by a little perseverance we found that the extent of that gentleman's knowledge of electric lighting matters had its alpha and omega in a leaflet or pamphlet issued (as we believe he must have been fully aware) not from the office of any gas paper, but from an organization whose tenets are anti-municipalistic to a degree. Well, we are now quite willing, having satisfied ourselves as to his electrical ignorance, to let bygones be bygones, contenting ourselves with knowing that Mr. Cripps is in complete accord with Mr. Justice Warrington's judgment in the action with the Empire Company. The learned Counsel holds that the contract entered into between the Corporation and the Company was in substance an assignment or transfer of the local electric lighting powers vested in the Corporation, and that such a contract was invalid unless approved by the Board of Trade. Mr. Cripps is therefore distinctly unfavourable to the Corporation appealing; and that body are in agreement with him. But this does not complete the story. Although the Corporation do not appear to be able to keep out of trouble through their hankering after the electric light, they (or someone in their service) know how to put a keen edge on to the wording of some of their communications when it is thought that the occasion requires. Such an occasion, in the opinion of the Corporation, occurred when Mr. Hawtayne, the Consulting Electrical Engineer, dared to send in his account for his services. The Council "repudiated liability," and thought it might be well for Mr. Hawtayne to consider the circumstances of this unfortunate business. We can quite imagine that Mr. Hawtayne has taken this letter (which has been published *in extenso* in the local papers) as a personal affront. It proceeds to inform him (of course, the Corporation's choice of him and acceptance of his advice had pleasantly convinced him of this previously) that the Corporation had looked upon him "as an expert in these matters, and a person who knew far better than themselves whether the electric lighting scheme was practicable, and how it should be carried out." But to follow this by saying that "the result has been most disastrous" must, whether true or not, be very hurtful to the recipient of such a communication. The suggestion has been made to Mr. Hawtayne that the case is one for an amicable arrangement, which may be supposed to mean that the Corporation want to get out of their obligations, so far as he is concerned, as cheaply as possible.

Manchester and District Junior Gas Association.

About twenty members of the Association paid a visit to the works of the Hebden Bridge and Mytholmroyd Gas Board on Saturday. They were conducted through the works by the Engineer and Manager (Mr. E. J. Wellens). The party was afterwards conveyed in brakes to the electricity works, to view a 250-horse power gas-engine driven by coal gas. The Electrical Engineer (Mr. Garside) had the engine started purposely for the members. The party then proceeded to Dawson City, where, on leaving the brakes, an engine and two trucks (fitted with seats) were in waiting, and the members were taken about six miles on the temporary railway belonging to the new reservoirs of the Halifax Corporation Water-Works. This proved to be a very enjoyable ride through beautiful scenery overlooking the Calder Valley. The engine was stopped at several interesting places *en route*, and the members spent some time examining the huge trenches that have been made to be refilled with concrete. One of these trenches is already some 165 feet deep. The party returned by rail to Hardcastle Craggs, where tea was served. A vote of thanks to Mr. Wellens, the Gas Committee, the Electrical Engineer, and to the Water-Works Contractor (Mr. Enoch Tempest), terminated the proceedings; and the party returned to the station highly delighted with the afternoon's outing.

Society of Chemical Industry.

The Annual General Meeting of the Society opened on Monday last week at University College, Gower Street, W.C., under the presidency of Dr. W. H. Nichols, who was supported by the President-Elect (Dr. E. Divers). A large number of members from the New York, New England, and Canadian Sections of the Society were present. The report of the Council showed that the number of members on the register was 4326, compared with 4134 at the preceding meeting. During the past year 452 members were elected, compared with 400 in 1903; and the losses were 260, against 216. There were 41 deaths, against 29. The financial statement presented by the Treasurer (made up to May last) showed a balance of revenue over expenditure of £1117. Since the last annual meeting, a New England Section has been constituted, covering the States of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. The inaugural meeting of the new Section, at which the President and many members of the New York Section were present, was held on the 14th of May. The Birmingham Section has also been revived. Beyond the President's Address, there was no business of a technical character at the meeting last week. A full programme of visits was gone through; and yesterday the American visitors, accompanied by a number of the English members, commenced a second round to the country Sections of the Society, including Manchester, Nottingham, Liverpool, Newcastle, and Glasgow. Elaborate arrangements had been made for the entertainment of the visitors, and the tour promised to be a memorable one in every respect.

The late Mr. Enoch Horton, who was Chairman of the West Gloucestershire Water Company, left estate valued at £160,800.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 190.)

THINGS on the Stock Exchange at length really did take a turn for the better last week. Political apprehension and the forced liquidations in the Kaffir Market, which had haunted the House, were now laid; and with money in smiling plenty, a degree of cheerfulness unknown of late prevailed. Business was not over and above brisk, and the settlement took most attention. But it was not a heavy affair; and happily it ran its course without any sign of a difficulty, although there had been one slight failure early in the week. Prices in almost every department advanced moderately and closed firm. In the Money Market, there was a stiffening early in the week; deposits on application for the Japanese loan being a large order in addition to the ordinary requirements of the Stock Exchange. But these were quickly and dexterously released; and all the rest of the week there was a condition of extreme ease. Business in the Gas Market was on a more restricted scale generally, and on some days the aggregate of operations was small indeed. But the tendency was firm and buoyant, and it looked like lasting. Changes in quotation were not very numerous, but were sufficient to emphasize the position. In Gaslight and Coke issues, the ordinary made a fair recovery from the little tendency to weakness which it had lately been showing, and the quotation was advanced a point. Dealings were not numerous; but the prices were progressive. The lowest figure, 98½, was marked on Monday; and from this point the price rose to 99⅞, at which figure stock changed hands more than once before the close. The secured issues were quiet. The maximum was done at 92¼; the preference was done three times, all at 109½; and the debenture at 89⅛ and 89¾. The quotation of the latter, which had certainly been allowed to stand rather high, was lowered a point. South Metropolitan was quiet but firm, and the prices at which transactions were marked ranged from 128½ to 130. The debenture marked 91 *cum div.* and 90¼ *ex div.* Commercials were hardly touched; one dealing in the 4 per cent. at 118⅝ being all. The Suburban and Provincial group was much the same as usual —viz., very quiet and very firm. Alliance new advanced; and on the local Exchange, Liverpool debenture rose two points. Bournemouth "B" marked 17⅛, Brentford old 252½, and ditto new 190¾ and 191⅝. British was done 40¼. The Continental Companies were on the whole a quiet market, though Union came in for more notice than usual owing to the issue of stock referred to last week. The first dealing in the ordinary was at 106, from which it got up to 109½ at the close; the quotation showing an advance of three points. Imperial was done at from 210 to 212, but European was not touched. Among the undertakings of the remoter world, Bombay marked 6⅝, Cape Town 17⅜, and ditto preference 10⅛. Buenos Ayres realized from 11½ to 11⅝, River Plate 12 1/16 to 12 1/16, Primitiva ordinary 5 1/16, ditto preference 5 3/32, and ditto debenture 96 and 96¼. San Paulo marked 13⅛, and South African 16.

The closing prices are shown in our list on page 190.

A CONSUMERS' HANDBOOK.

A HANDBOOK for gas, water, and electricity consumers forms one of a series of "Legal Handy Books" published by Effingham Wilson, with the laudable object of spreading a knowledge of the law at a price which is within the reach of everyone.* The dearness, however, of cheap law is proverbial; and the consumer will do well not to rely any too implicitly upon the guidance of Mr. Laurence Duckworth, Barrister-at-Law, as impersonated in these pages. There is doubtless much information in them which is both useful and reliable; but there is also some which is neither the one nor the other. In this category is the statement that the "pressure in testing gas must be equal to a column of water 3 inches high;" and also the one that "*no higher price can be charged by any gas company for common gas* than 5s. 6d. per 1000 cubic feet, and for *cannel* gas (which means gas whose brilliancy equals 20 candles) 7s. 6d. per 1000 feet. Where a company has changed common gas to cannel gas, or *vice versâ*, which it may do, provided a three months' notice has been given of its intention to do so, it cannot charge more than 4s. 6d. per 1000 cubic feet for common gas supplied in place of cannel gas." The italics are the author's. It would be interesting to know the source of his information on this subject. There is an old-time flavour about it which is scarcely in keeping with the "revision" which this work is supposed to have recently undergone. As our readers are well aware, non-statutory gas undertakings are under no restrictions as to price; while statutory undertakings are limited in this respect by their Special Acts of Parliament or their Provisional Orders. In the Board of Trade returns are to be found plenty of instances of maximum prices for common gas exceeding 5s. 6d. per 1000 cubic feet. Where, also, is the authority for the latter part of the following? "*Notice must be given by the gas company* of any intention on its part to raise the gas rate in any district." Doubtless. But "in all such cases a fortnight's notice must be given in some paper which circulates in the district; there must be fourteen consecutive insertions one month prior to alteration; and, where there is any objection raised by the local authority, the matter must be decided by arbitration." Surely the wish must have been father to the thought in this matter; for what a field it opens up, in imagination, for the lawyer and the expert witness.

Much is said about the limitation of profits which may be divided by gas companies, and their powers with respect to the formation of reserve funds; while the machinery by which reduction in the price of gas may be brought about through the medium of the Court of Quarter Sessions is fully described. Curiously enough, however, there is not a word about the provisions of the sliding-scale of dividend, by which this legislation has, for practical purposes, become obsolete. This is the more noticeable since the first edition of the work was not published till about a quarter-of-a-century after the introduction of the now almost universal sliding-scale legislation. But its character for up-to-dateness is further shaken by the statement that "the minimum illuminating power now usually required is a light equal to 15 sperm candles—16-candle gas is required from each of the three Metropolitan Gas Companies." It may be mentioned, also, that reference is made to certain provisions of the Metropolis Gas Act, 1860, as though these were obligatory on all gas undertakings alike; while the following paragraph seems to need elucidation: "In regard to municipal authorities, it may be stated that each of the three Metropolitan Companies has a monopoly in its own district. Urban district councils (including town councils) must obtain a Government Board Order authorizing them to supply gas within their district where the commercial supply exists." This delightfully hazy statement is a fitting preparation for the further bald one that the judgment of the House of Lords in the case of the *Cannon Brewery Company v. The Gaslight and Coke Company* establishes the non-liability of an incoming tenant for the arrears of gas or meter rent left by the outgoing tenant. Lest any consumer of gas should be misled, it requires to be explained that this was a case of the incoming tenant not requiring a supply of gas. Had such been needed, the Gas Company might, to quote from Lord Macnaghten's judgment, "have entered into any contract in relation to it not contrary to the terms and conditions of the code. As a condition of such supply, the Gas Company, under the circumstances, might have required from the Brewery Company payment of the arrears left unpaid by the outgoing tenant."

Sufficient has been said to show that whatever merits this handbook may possess are marred by serious blemishes, and that it requires very careful revision before it can be accepted as fully reliable and up-to-date.

* "The Consumers' Handbook of the Law Relating to Gas, Water, and Electric Lighting (Third Edition)." By Laurence Duckworth, Barrister-at-Law. London: Effingham Wilson; 1905.

THE GERMAN ELECTROLYSIS COMMISSION.

THE report of the Commission appointed by the German Society of Gas and Water Engineers to investigate the subject of the corrosion of gas and water mains under the influence of stray currents from electric street trams, which was presented to the parent body at the Coblenz meeting, contains an account of the work undertaken during the past year. Tests and experiments were carried out in Leipzig and Hamburg, where, for the protection of the mains, arrangements had been made which in many respects agree with the recommendations already published by the Commission; in Erfurt, where the gas-pipes have been found to be suffering severely; in Freiburg i.B., where no injuries have yet been detected, but where the municipal owners of the gas, water, and electricity works desired to have their mains and return conductors examined; in Strasburg, where the water-mains have been attacked, and where the local authorities requested an investigation; and in Dresden, where the use of bare return conductors for the electricity offers an opportunity for the collection of unusually valuable information on the whole subject. The most exhaustive researches, however, were instituted in the two last cities.

Measurements of the potential of the mains and tram rails in Strasburg gave figures which were much higher than they should be. Close to the generating station, a mean value of 2·2 volts, and a maximum of 2·8 volts were obtained; the mains being positive in respect to the rails. At a great distance from the station, the mean potential was 4 volts and the maximum 11·5 volts; the mains being negative in respect to the rails. Direct measurements of potential at the different points of attachment of the insulated return conductors to the rails were impossible at Strasburg, owing to the insufficient number of test wires. Such wires, indeed, were present, but nearly all were rendered useless through breakage or faults in the insulation. Hence the currents flowing in the return leads were measured, and the resistances calculated from their diameters and lengths. From the resistance and the current, the fall in potential in each cable was calculated; and the differences between the falls in potential of each cable gave the differences of potential between the various taking-off points.

According to the rules of the Commission, these differences should be practically zero; at Strasburg they were found to reach 6·5 volts. The return conductors at Strasburg have the same

diameters as the outward leads, and are connected to the rails at points exactly opposite those where the outward leads join the trolley-wires. (This arrangement is common, because it enables the return to be temporarily made the outward conductor when failures in the insulation occur.) Thus the differences in potential are due to a lack of proper relationship between the volume of current which each return should carry and its length and resistance; and more particularly to the existence of a taking-off point in immediate proximity to the central station, joined to the minus pole of the dynamo through a short thick cable of very low resistance only. When a small resistance-piece was inserted in the short return mentioned, the maximum difference in potential between any two different taking-off points fell at once from 6·5 to 2·8 volts; and the corresponding difference between main and rail fell, on an average over the whole district, to about one-half of its former value.

In many places currents up to 1 ampere in volume were found to be flowing in the mains, but only when the cars were running. Given suitable conditions (high current density, a soil capable of acting as an electrolyte), such currents are competent to act very corrosively where they emerge from the pipes. From measurements made simultaneously, it was found that the currents flowing in a few of the return conductors only differed slightly in volume from those in the corresponding outward leads (as should be the case), but that the differences were serious when the conductors were very long or very short. The longest return carried less than a third of the corresponding outward current; the shortest carried more than four times its proper amount. Nothing else can be expected, for as the taking-off point far from the station has a much higher potential than that near the station, much of the current that is supposed to flow back by the long return flows by the earth and the rails, re-entering a return at a point of low potential.

Numerous measurements were made of the conductivity of the rail-joints. This was found to vary very much—increasing the resistance of the entire track even up to 100 per cent. The electrically welded joints, and those made by Goldschmidt's "Thermite" process, however, were found excellent, possessing in many cases the same conductivity as the rails themselves.

The whole experiments show how important Paragraph 6 of the rules drawn up by the Commission is; for if variable resistances were put into all the return conductors, as there specified, and arrangements were made for testing them periodically, there is no doubt that the differences in potential, and consequently the danger to the mains, would be reduced to very small dimensions. This is specially important at Strasburg, for the composition and dampness of the soil favour good conductivity and electrolytic action.

In many respects circumstances at Dresden resemble those at Strasburg; but as there are two generating stations, and taking-off points exist near each of them, there are two regions or points of minimum potential. Moreover, Dresden is separated by the Elbe into two separate districts, and the two stations are on the same side of the river; so that the stray currents from the one side all pass back to the other through the limited number of mains which cross the bridges. The return conductors, which, as mentioned already, are not insulated, lie in earthenware channels filled with soil; and as the pipes are not water-tight (many were broken when they were being laid), the earth inside is wet. Thus rails, return leads, and earth form three parallel conductors, sharing the current according to their conductivities. In most places the conductors are well joined to the rails every 100 yards or so; but in spite of the high conductivity of copper, their small diameter enables them to withdraw but little current from the rails, which are jointed excellently. Thus from a point far distant from the station to its vicinity the current carried by the rails steadily increases—large differences in potential occurring in them, as well as in the earth and in the mains.

Measurements made in Dresden show the differences of potential in the rails, per kilometre of track, to increase progressively from 0 to about 5 volts. Some of the mains carry very heavy currents—*e.g.*, a large gas-main was found to be taking about 4 amperes. The highest differences in potential between mains and rails, where the former were endangered by being electro-positive, were naturally found close to the generating stations, and amounted to about 3 volts. The potentials and currents flowing during the night when the tram service was suspended were negligibly small in comparison with those of the daytime. As at Strasburg, there were no attachments to the return conductors for a proper control of the potentials at the taking-off points.

Hitherto noticeable corrosion has only been observed at Dresden in lead service-pipes which cross the rails, and then only in the neighbourhood of the older generating station built in 1893. These uninsulated lead pipes are good conductors for the stray earth currents, and so to some extent they are reported to protect the iron mains. A trace of attack was seen in an iron pipe laid bare for the purpose of making measurements, and this was also close to the older central station. The condition of affairs at Dresden can only be slightly improved by a regulation of the return conductors. This would ensure a constant potential at all taking-off points; but the escape of current into the earth, and its re-entry into the conductors at suitable spots, can only be avoided by the employment of insulated returns. Some such are now being laid.

The Commission was especially asked to examine the case of a 4-inch water-main which had been in use for thirty years at Strasburg, and which had got so corroded that a length of 150 yards had to be renewed. Previous measurements had shown that the pipe lay in a district neutral as regards potential, where neither protection nor corrosion might be expected; and it was therefore thought either that an escape of current from the pipe into the earth (but not into the rails) had been brought about by badly made joints which offered some resistance to the passage of electricity, aided by much ground-water and the presence of some other good conductor, or else that the damage might have been done at a former time when electrical conditions might have been different. The joints were found bad in places, and the ground-water high; and it was noticed that the pipe lay close to the River Ill, which also flowed past the central station. On the other hand, a second main, of equal age, lying in similar soil, in a parallel street, but one in which no tramway ran, was not corroded; and, moreover, the corroded spots in the former were not distributed uniformly round the pipe, but were accumulated at the side facing the rails. Further measurements were made which agreed with the earlier ones; the currents flowing in the mains, and their irregularities due to fluctuations in the working of the tram service, were found to be too small to account for the damage. In the meantime, the old 4-inch main was replaced by one of 6 inches, and conditions were somewhat altered.

Inasmuch, however, as this case of corrosion is typical, and it is very important that the matter shall be thoroughly studied, the Commission has determined to institute experiments to ascertain whether it is possible for iron to be corroded in a fashion resembling that of the pipe in question when lying in soil of the composition of that in Strasburg, without the assistance of external energy; and, if so, whether the process is accompanied by any local manifestations which can be detected with certainty and measured with fair accuracy. To this end, the Commission has sought the aid of a chemist and an electro-chemist, whose researches have already begun.

The report passes on to describe two new instruments obtained during the past year—a recording amperemeter, which can also be used as a voltmeter, and a portable joint-tester. Both were made by Hartman and Braun.

GERMAN ASSOCIATION OF GAS ENGINEERS.

Exhibition of Gas Appliances at Coblenz.

In connection with the General Meeting of the German Association, which was held, as reported in the "Journal," at Coblenz, from June 28 to July 2, there was a small exhibition of appliances of interest to gas engineers. It was housed mainly in one of the rooms on the ground floor of the Banqueting Hall, in the chief chamber of which the proceedings of the meeting were conducted.

There were many exhibits of apparatus for the lighting and extinguishing of gas-burners from a central or distant spot. The general principles on which most of these devices act are known to English gas engineers, and we need here only specify the more important varieties exhibited at Coblenz. There were at least five forms of apparatus for the lighting and extinguishing of lamps automatically through a change of pressure of the gas in the supply main. The object of these appliances is, of course, to allow street gas-lamps to be lit and extinguished by a momentary rise or fall of the gas pressure, which is readily effected at the gas-works. A rise or fall of $\frac{1}{2}$ to $\frac{3}{4}$ inch above or below the normal distributing pressure is generally required to actuate the devices, which are, of course, purposely made insensible to smaller fluctuations of pressure. The firms exhibiting these "pressure" lighters and extinguishers were: Hoffbaur and Co., of Dortmund; E. Burgemeister, of Celle; Jacob Brothers, of Zwickau; Himmel's Works, at Tübingen; and the Berlin-Anhalt Engineering Company, of Berlin.

Butzke's Incandescent Gas Light Company, of Berlin, exhibited an arrangement for igniting and extinguishing one or more of several groups of gas-burners at a time. A separate service of small diameter is employed by them to feed the pilot-jets. The same firm also showed a platinum sponge and wire automatic lighting device, with special provision for protecting the sponge and wire. They also exhibited a gauze cone for insertion in the mixing-tube of atmospheric gas-burners to prevent the flame striking-back. The "Lucifer" automatic gas lighter, made by Lüttges and Co., of Cologne, comprises two types—one retaining the pilot-jet, and the other having an electrical lighting device. Street-lamps of various patterns specially designed for use with incandescent gas-burners were exhibited by several firms. Himmel's Works at Tübingen showed several lofty standards for high-pressure gas-lamps for lighting open spaces, &c., as well as lanterns for clusters of burners and intensified burners for general outdoor lighting. The Cologne Gas and Electricity Company are the makers of the "Ritter" lantern, of which 100,000 are in use. The Cologne Iron-Works and the Rhenish Apparatus Constructing Company, of Brühl, near Cologne, showed specimens of "Rech's" lantern, in which a certain amount of pre-heating of the air supply is effected, and special storm-proof qualities are secured. Street-lanterns with convex reflectors are made by L. Schnorrenberg, of Cologne. The firm of F. Lux, of Ludwigshafen-on-the-Rhine, showed Lux's gas-balance for determining the specific gravity of illuminating gas, gas-pressure gauges, various types of

counters and velocity recorders, water filtering plant, and water-meters. Messrs. Elster and Co., of Mayence, showed prepayment and other gas meters, among them being an hourly consumption indicator. Herr E. Burgemeister, of Celle, exhibited taps and pressure regulators. This firm makes a washer, with a special sprinkling apparatus, which has been described in the "JOURNAL," and an automatic milk-of-lime pump for use with sulphate of ammonia plant.

Among the heavier plant, which could not well be exhibited in the limited space, but of which photographs and drawings were shown, may be mentioned Eitle's drawing and charging machinery, and wire rope conveyors as made by Messrs. A. Bleichert and Co., of Leipsic. Water-pumps were also similarly brought forward by Messrs. Körting Brothers, of Hanover, and Klein, Schanzlin, and Becker, of Frankenthal. Hydrants and water-valves were also advertised in connection with the exhibition by several other firms. Messrs. Court and Baur, of Ehrenfeld, near Cologne, displayed work done with their tar-covering paints in several colours. These paints, which can be applied to previously tarred iron-work, &c., should prove very useful on gas-works, if only to relieve the monotony of the coating of tar. The same firm showed examples of the use of their rust-preventing paints for iron work. Mantles were exhibited by Butzke's Company, of Berlin; and the well-known "Prometheus" gas-cookers were in evidence.

One of the most interesting of the exhibits was the "Nurnberg" light, which is an oxy-gas incandescent light. The effect of raising a mantle to incandescence by supplying neat oxygen along with the gas to the burner is certainly very favourable. We can vouch for the intense brilliancy of the light; and the gas consumption appeared to be extremely small. There was, of course, no provision at the exhibitor's stand for showing directly the consumption of gas and oxygen; but the following figures are taken from the circulars of the German Nurnberg Light Company, of Berlin. A light of 100 Hefners, or 88 English candles, is obtainable with a consumption of only 1·236 cubic feet of gas and the same volume of oxygen. Three sizes of burners are made; one yielding 61-candle power for a consumption of 0·777 cubic foot of each gas; the second yielding 121½ candles for 1·695 cubic feet; and the third 438 candles for 5·65 cubic feet. It is believed that oxygen can be obtained by Lindé's process and supplied through special mains or services in a town at a price of 4s. 6d. or less per 1000 cubic feet; but the price might rise to 17s. per 1000 cubic feet before the Nurnberg light would become as costly—light for light—as ordinary incandescent gas lighting. These figures would indicate that it is only a question of obtaining oxygen at less than 17s. per 1000 cubic feet for the Nurnberg light to become widely adopted; but it must be remembered that dual services are required right up to each burner. The light itself is of an agreeable white colour. It is proposed to use the oxygen-gas mixture for cooking and heating purposes also. In regard to the price of oxygen, the Nurnberg Company's circular quotes it in cylinders under pressure at 7s. 2½d. for 42·38 cubic feet, or at the rate of about £8 10s. per 1000 cubic feet. At this price, the light must clearly remain a luxury.

At a Congregation of the University of Birmingham on the 8th inst., the degree of B.Sc. was conferred on Mr. Alfred B. E. Blackburn, Assoc.M.Inst.C.E., F.G.S., the Resident Engineer and Manager of the Sunderland and South Shields Water-Works Company.

The compressibility of different gases below atmospheric pressure, and determination of their molecular weights, formed the subject of a recent communication to the Paris Academy of Sciences by MM. Adrien Jaquerod and Otto Scheuer. The compressibility of several gases has been measured at 0° C. for pressures between 400 and 800 mm. of mercury, and for ammonia and sulphur dioxide for pressures between 200 and 400 mm. From the measurements, the coefficient of deviation from Boyle's law has been determined, and this has been applied to the formula of M. Berthelot for the limiting density of gases and the estimation of their molecular weight. The molecular weights calculated agree with those obtained by the best analytical methods, with the exception of nitrogen compounds, for which an atomic weight of 14·01 must be assumed.

We have recently received the volume of "Transactions" of the Society of Engineers for the past year. The book contains the report of the proceedings at the various meetings that were held under the presidency of Mr. D. B. Butler, the papers read being amply illustrated. An account is also given of the vacation visits, which have for many years been so instructive a feature of the Society's work. One of the papers was by Mr. Frank Latham, the subject being "Some Recent Works of Water Supply at Penzance;" and for it he was awarded a premium of books. The report of the Council and the statement of accounts are given; and the useful general index to the proceedings is brought up to date. The book has been produced under the editorship of Mr. Perry F. Nursey, the Secretary and a Past-President, who has made it specially interesting by the retrospect of the past fifty years' work of the Society presented by him at the Jubilee meeting in May, in which work, as those who have watched the growth of the Society are aware, he has had a very large share.

SULPHUR IN COKE AND ITS REMOVAL.

QUITE recently Professor F. Wuest, Ph.D., and Herr F. Wolff, of Aachen, have stated the results of their investigation into the question of sulphur in coke. The ultimate end they had in view was the better understanding of the effect of the sulphur introduced along with the fuel into blast-furnaces; but the researches include the quantitative determination of many facts important to gas engineers. The practical value of the experiments, as applied to gas manufacture, is not restricted to an understanding of the destination of sulphur in ordinary carbonization, but reaches to the methods for improving the quality of gas coke intended for special uses. The removal of sulphur and arsenic from coke to be used in malt-kilns is of pressing importance in many provincial centres, and the means for its accomplishment appear to be well indicated by the experiments here briefly described.

The coke experimented upon was from the Westphalian Ruhr district; and it contained as total sulphur 1·406 per cent., carbon 86·07 per cent., and ash 10·05 per cent. The composition of the ash was as follows:—

Bases.	Per Cent.	Acids.	Per Cent.
Al_2O_3	27·36	SO_3	2·292
SiO_2	38·26	P_2O_5	0·500 = P 0·220
Fe_2O_3	21·50 = Fe 15·05		
Mn_3O_4	0·61 = Mn 0·44		
CaO	6·13		
MgO	3·32		

The mineral constituents of the coke with which the sulphur is chiefly associated are iron, manganese, calcium, and magnesium; and they were present in the coke as follows:—

Iron	1·511 per cent.	Calcium	0·441 per cent.
Manganese	0·044 ,, ,,	Magnesium	0·201 ,, ,,
	1·555 per cent.		0·642 per cent.

The mean of several tests gave 0·116 per cent. as the amount of sulphide sulphur it was possible to eliminate as sulphuretted hydrogen. The quantity of sulphate sulphur was 0·0922 per cent.; thus leaving 1·198 per cent. as organic sulphur [1·406 − (0·116 + 0·0922)]. The proportion—viz., 1·198 ÷ 1·406 = 85·2 per cent. of the total as organic sulphur—agrees with the published results of Bradbury, Muck, and Blum, who have shown it to range from 66 to 92 per cent.

The combustible sulphur, by burning finely-powdered coke in a current of oxygen, was found to be 1·09 per cent.; and of this more than 15·93 per cent. was burnt to sulphur trioxide (SO_3), and not deposited in the condensers. This tendency of the sulphur in the coke to become oxidized in a higher degree than sulphur dioxide (SO_2) increases as the temperature rises and as the excess of oxygen becomes greater.

The further experiments made were to ascertain the behaviour of sulphur, in the presence of hydrogen, water vapour (steam), nitrogen, carbon monoxide, and carbon dioxide. Powdered coke was placed in a porcelain boat, about 4 inches long and ⅝ inch wide, inserted in the combustion-tube of a Heræus electric-resistance furnace. For recording the temperature, a platinum-rhodium thermo-couple was used, which was protected by a thin porcelain tube.

Experiments with Hydrogen.—The purified gas was passed through at the rate of 2 to 2½ litres per hour, over 1½ grammes of coke. At about 470° to 490° C., the acetate of cadmium condenser began to cloud, and a precipitate of sulphide of cadmium took place.

Temperature in Degrees Centigrade.	Loss on Ignition, per Cent.	Sulphur Volatilized as Sulphuretted Hydrogen, per Cent.	Sulphur Volatilized as a Percentage of the Total Sulphur.
500	1·56	0·107	7·59
600	1·82	0·324	22·99
800	2·49	0·590	41·87
900	5·01	0·645	45·77
1000	10·06	0·721	51·17

As shown by this table, the quantity of sulphur volatilized at 600° C. is three times that at 500° C. Beyond 600°, the rate of volatilization increases slowly, until at 1000° the quantity is rather more than half the total sulphur content. It was found also that, by prolonging the period of the passage of the hydrogen, and maintaining a constant temperature, an increased quantity of sulphuretted hydrogen was formed. For example, at constant temperature there was volatilized in 2½ hours 0·403, and in 6 hours 0·562 per cent. of sulphur. With another sample of coke containing 1·5 per cent. of sulphur, the quantity volatilized as sulphuretted hydrogen in 9¾ hours was 0·737 per cent. of sulphur. The coke was not altered in appearance by any of these tests, beyond turning somewhat darker at the higher temperatures. The degree of applicability of this and the succeeding tests to gas manufacture will be better understood by remembering the temperatures found to exist in the charges of coal by Mr. J. Bond. In the paper read at the recent meeting of the Institution of Gas Engineers, and given in the "JOURNAL" for June 6 (p. 691), he showed these to vary from 400° C. to 1100° C.

Tests with Steam.—The acetate of cadmium began to cloud at 350° to 380° C., which proves that the hydrogen in the nascent

state begins to exercise its influence on the sulphur in coke at a much earlier stage than the pure dry hydrogen. At 900°, the steam volatilizes more sulphur in the form of sulphuretted hydrogen than does pure dry hydrogen at 1000°; but this was accompanied by "losses on ignition" of 2, 7, 14, and 9 times that of hydrogen respectively. At 500° and 600°, the coke had not altered in appearance. At 800°, the surface seemed to have caked, and the coke adhered firmly to the sides of the porcelain boat—the edges being grey-white. At 1000°, the mass of coke was grey-white throughout.

Temperature in Degrees Centigrade.	Loss on Ignition, per Cent.	Sulphur Volatilized as Sulphuretted Hydrogen.	
		Per Cent. by Weight of the Coke.	Per Cent. of the Total Sulphur.
500	2·14	0·181	12·84
600	2·94	0·187	13·27
800	16·72	0·519	36·83
900	70·88	0·726	51·52
1000	89·18	0·764	54·34

Besides the sulphur given off as sulphuretted hydrogen, a portion of it formed sulphur dioxide (SO_2), and at the higher temperature sulphur trioxide (SO_3). But the tendency to form sulphuretted hydrogen was found to be stronger than the tendency to unite with oxygen to form sulphur dioxide. The volatilization proceeds very rapidly; for in one test, at the end of three hours, 0·76 per cent. had been driven off as sulphuretted hydrogen. At 1000° C., the coke was completely incinerated.

Tests with Nitrogen.—Purified gas was passed through the furnace at the rate of 1·3 litres per hour. As it issued from the heated tube in the electric furnace, it was led through two condensers containing alcoholic soda liquor. Lest any loosely-combined organic sulphur should have been driven off with the glowing carbon, forming bisulphide of carbon (CS_2), a fixed quantity of the alcoholic soda solution was each time tested for the presence of the bisulphide, but no trace of it could be detected. In the remaining portion of the soda solution, an increase of sulphur was noticeable, corresponding to the diminution of sulphur in the coke. At 1000° a fairly large percentage of the total sulphur was given off as gas. The authors say there can be no doubt that, together with escaping hydrocarbons, a portion of the organically combined sulphur was carried off by the nitrogen.

Temperature in Degrees Centigrade.	Loss on Ignition, per Cent.	Sulphur Remaining in Coke, per Cent.	Sulphur Volatilized in Percentages of the Total Sulphur.
500	1·03	1·372	2·41
600	1·43	1·337	4·90
800	2·16	1·326	5·90
900	2·83	1·308	6·97
1000	4·50	1·162	17·35

Tests with Carbon Monoxide.—Purified gas, admitted at the rate of 1·5 litres per hour, was passed off from the electric furnace through two condensers with measured quantities of potash liquor containing bromine, which were intended for the absorption of the volatilized sulphur.

Temperature in Degrees Centigrade.	Loss on Ignition, per Cent.	Sulphur Remaining in Coke, per Cent.	Sulphur Volatilized in Percentages of the Total Sulphur.
500	1·49	1·226	12·80
600	1·69	1·171	16·89
800	2·20	0·975	30·80
900	2·35	0·879	37·61
1000	3·06	0·869	38·32

The table shows that with losses on ignition that were not great the proportion of sulphur volatilized increased considerably from 500° C. upwards. The organic sulphur probably partly combined with the carbon monoxide to form oxysulphide of carbon (COS), which is immediately split up in the condensers into carbonic acid and sulphuretted hydrogen. The bromine then causes the latter to oxidize to sulphuric acid (H_2SO_4). It was also observed in these experiments that carbon monoxide was decomposed, and that this not only occurred at the lower temperatures, but continued as the temperature rose. The heaviest deposit of carbon was always observed at 1000° C.; but it is doubtful whether at this temperature the equation $2CO = C + CO_2$ still holds good since the reduction of carbon dioxide by means of carbon has then become very active, and its formation would therefore be hardly likely to occur. In every test it was found that the potash solution with bromine had absorbed carbon dioxide. The effect on the sulphur in the coke of the decomposition of the carbon monoxide may be represented thus:

$$\left.\begin{matrix}CO\\CO\end{matrix}\right\} + S = C_2 + SO_2.$$

Tests with Carbon Dioxide.—Purified gas was admitted to the tube heated by the electric furnace at the rate of 2 to 2·3 litres per hour, and was thence led through condensers with bromic hydrochloric acid or permanganate of potash. Up to 900° C. the quantity of sulphur volatilized as sulphur dioxide (SO_2) increased very slowly, and at 1000° it amounted to only 18·29 per cent. of the total sulphur. But the sulphur volatilized in all its forms was 59·25 per cent. of the total; leaving 40·75 per cent. unaccounted for. This is explained by the formation of sulphur trioxide, which cannot be traced in the condensers:—

$$3CO_2 + S = 3CO + SO_3.$$

Carbon dioxide + Sulphur = Carbon monoxide + sulphur trioxide.

This difference, due to sulphur trioxide, sets in at about 800°, is noticeable at 900°, and is quite marked at 1000° C.

Temperature in Degrees Centigrade.	Loss on Ignition, per Cent.	Sulphur Volatilized as Sulphur Dioxide, per Cent.	Sulphur Remaining in Coke, per Cent.	Total of Sulphur Volatilized in Percentage of Total Sulphur Content.
500	0·98	0·101	1·315	6·47
600	1·08	0·144	1·289	8·32
800	3·56	0·175	1·181	16·00
900	14·54	0·190	1·048	25·46
1000	51·71	0·257	0·573	59·24

In these tests, the burning of the sulphur to sulphur dioxide depends on the reduction of the carbon dioxide at higher temperatures by contact with carbon. According to Naumann and Pistor, the reduction begins at about 530° C., when the gas comes in contact with glowing carbon; but it depends also on the surface of contact. In the same manner, then, as the carbon is attacked by carbon dioxide, the sulphur of the coke is also carried off by oxidation, and unites with the carbon dioxide. The two actions are represented:—

$$2CO_2 + C_2 = 4CO.$$
$$2CO_2 + S = 2CO + SO_2.$$

The tendency to produce sulphur trioxide at temperatures above 800° C. was confirmed by another series of tests in passing carbon dioxide over the heated coke.

The authors then proceed to discuss the absorption of the sulphur, when disengaged from the coke, by the high temperatures and the gases already referred to in the blast-furnace. Their conclusions are as follows: (1) That up to 500° the sulphur of the gases is taken up by the ferric oxide alone. (2) At 600° the limestone scarcely exercises a perceptible influence on the absorption of the sulphur. At 800° the conditions suddenly change, and the limestone then far outstrips the ferric oxide in its capacity for the absorption of sulphur from the gases. This is the temperature at which the limestone ($CaCO_3$) begins to decompose more rapidly; and the combining of the sulphur is therefore to be attributed to the formation in the first place of lime (CaO).

ON CARBONYLFERROCYANIDES.

At the Annual Congress of the Société Technique, a paper on the above subject was submitted by M. Casaubon. Though the results of the author's researches are only of academic interest to the majority of gas managers, we give a fairly full translation of his communication.

Carbonylferrocyanic acid has the formula $Fe(CN)_5 COH_2$, and it results from the substitution of the radical CO for HCN in ferrocyanic acid. It was discovered by Orthlieb, and afterwards by Mahla, in the residues obtained in the purification of coal gas; and it has been studied by Muller. For the qualitative test of carbonylferrocyanides in ferrocyanides, two processes have been employed—viz., fractional precipitation and solution in alcohol. Both are lengthy processes, and moreover are not exact—the first, because there is formed a soluble blue, which is a trouble in filtration; the second, because it is necessary to treat solutions which have been completely deprived of other salts. For the separation and estimation, M. Muller employs acetate of lead, which in an acetic acid solution precipitates the ferrocyanides but not the carbonylferrocyanides. In order to study the formation of the latter in gas purification, and in particular during the extraction of cyanides by metallic solutions, the author worked out: (1) A rapid and sensitive method for the identification of carbonylferrocyanides; (2) a volumetric method, quick and fairly accurate, for their quantitative determination; and (3) a process for separating them from potassium ferrocyanide.

Taking first the qualitative test for carbonylferrocyanides in the presence of ferrocyanides, if a solution containing these substances is treated with nitric acid at boiling-point, the latter is converted into nitroferricyanide, while the former is completely oxidized, and gives a beautiful violet precipitate. If the solution is very diluted, the precipitate does not form, and therefore a concentrated solution should be employed. If there are only traces of carbonylferrocyanide in a solution containing large quantities of ferrocyanide, the precipitate is not visible in consequence of the deep coloration which the nitroferricyanide gives to the liquid. But however small the proportion of carbonylferrocyanide may be, the violet coloration is always produced, and can easily be recognized with a little practice. The action of chlorides in solution of ferrocyanide and carbonylferrocyanide was examined by preparing a solution of these two bodies, in doing which it is difficult to avoid the introduction of a certain quantity of chloride, inasmuch as the precipitate first obtained

with ferric chloride, to be afterwards dissolved in potash, is very difficult to wash completely. In order to see at once if the washing has been sufficient, the solution of the two ferrocyanides is precipitated by silver nitrate and briskly shaken with an excess of strong sulphuric acid until the silver has completely gone into solution. If chlorides are present, a white precipitate of silver chloride will remain, insoluble in sulphuric acid.

In working out the volumetric estimation of carbonylferrocyanide and ferrocyanide, M. Muller noticed the great resistance of carbonylferrocyanides to oxidation compared with that of ferrocyanides. The author, on the other hand, has observed that if one adds drop by drop to a solution of these two bodies a solution of potassium permanganate, the ferrocyanide is first completely oxidized, and the carbonylferrocyanide shown after this oxidation by a brown precipitate in the test drop. It is therefore possible to make the volumetric estimation of the two substances by the usual process with permanganate by observing the following directions: The solution must be weak and freely acidified with sulphuric acid; and the end of each of the two oxidations (of ferrocyanide and of carbonylferrocyanide) must be ascertained by test drops, and not by noting the colour of the liquid. It is not possible to obtain very great accuracy with this process. The end of the reaction on the carbonylferrocyanide is difficult to note, as a good deal of brown precipitate is formed; but, after practice, the error should not exceed 2 or 3 per cent. The appearance of brown precipitate on the oxidation of the ferrocyanide may be taken as indicating the presence of carbonylferrocyanide.

After his first investigations, M. Muller made known the existence of carbonylferrocyanides. Returning later to this subject, he showed that oxidation by chlorine does not give a carbonylferrocyanide, but a body corresponding to the formula $K_{13}Fe_5(CO)_5(CN)_{25}$, in which two-fifths only of the ferrous iron exists as ferric iron. If a solution is made in caustic potash of the violet precipitate obtained by boiling nitric acid, a solution is obtained which is precipitated by both ferric and ferrous salts. This seems to point to the absence of carbonylferrocyanides. On the other hand, the action of permanganate would seem to indicate that these ferrocyanides exist, as when its action has been completed all precipitation by ferric salts is arrested. However this may be, these substances, if they exist at all, are unstable, for if the solution treated with permanganate is precipitated by a ferrous salt and the precipitate dissolved in potash, a solution is obtained which is once more precipitable by ferric salts. The most simple process for the volumetric estimation of pure carbonylferrocyanide solutions consists in precipitating with a standard solution of copper sulphate. The drop tests are best made with ferrous (not ferric) salt, as the coloration is much better seen.

In preparing carbonylferrocyanides from ferrocyanides, M. Muller has shown that the carbonylferrocyanide is formed when a solution of ferrocyanide is kept for two or three days at a temperature of 135° C. (275° Fahr.) in an atmosphere of carbonic oxide. The equation is as follows:—

(1) $Fe(CN)_6K_4 + CO + H_2O = Fe(CN)_5COK_3 + NH_3 + CO_2HK$

The reaction is limited by the following:—

(2) $4Fe(CN)_6COK + 4H_2O = 3Fe(CN)_6K_4 + 4CO + (HCO_2)_2Fe + NH_3$

The author effected the rapid transformation of ferrocyanide into the carbonyl compound in the following way: On heating powdered potassium ferrocyanide in a capsule with strong sulphuric acid, there is seen, after a few minutes, an abundant evolution of carbonic oxide, which causes frothing of the liquid. If the reaction is stopped at this stage by withdrawing the flame, the capsule is found to contain carbonylferrocyanide, which can be recognized without any other test by the fact that the sides of the capsule which are moistened by the froth become violet at the end of two or three hours' contact with the oxygen of the air. It appears, therefore, that the accepted theory of the reaction for the preparation of carbonic oxide by potassium ferrocyanide is actually complicated by a secondary process.

With reference to the presence of carbonylferrocyanides in spent purifying material, an examination of material from nine different sources disclosed the presence of carbonylferrocyanide in all; the proportion varying from 2·5 to 7 per cent. of the total cyanide extracted. In works where the spent material is treated, the carbonylferrocyanide is found in the mother liquor of the potassium or calcium ferrocyanide, whence it is easy to extract it by precipitation with ferric chloride. As regards the production of carbonylferrocyanides by the Bueb-Guillet process, they are formed not only in the purifiers, but also in the solutions of ferrous sulphate precipitated by a stream of crude gas. M. Guillet has shown that when the passage of the gas through the liquid is too long, the latter becomes supersaturated; so that after treatment with sulphuric acid, the filtered solution of ammonium sulphate still contains ferrocyanide. But by arresting the process at the right moment, all the ferrocyanides can be precipitated, leaving the carbonylferrocyanide in solution with the ammonium sulphate. After filtration it can be precipitated by iron salts. However this may be, the cyanide material obtained in the Guillet process invariably contains carbonylferrocyanide.

In attempting to ascertain how this body is formed, the gas was admitted into a flask containing ferrous sulphate, and samples were taken off at certain intervals and treated first with sulphuric acid and then with caustic potash, so as to obtain the cyanogen as ferrocyanide of potassium. The latter was precipitated with the ferric chloride, washed, and re-dissolved in a slight excess of potash; and the ferrocyanide and carbonylferrocyanide thus obtained were determined. The following were the results:—

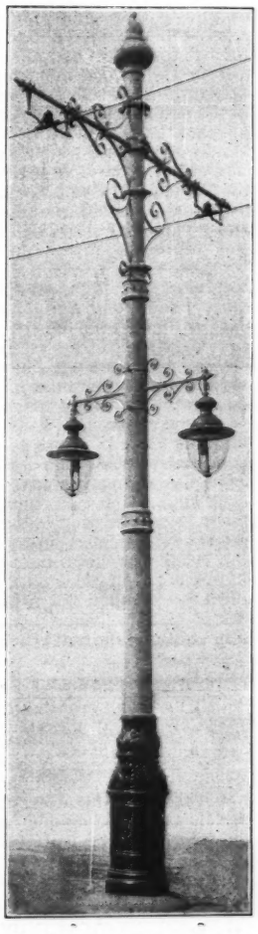
Litres of Gas.	Cyanide in 10 Cubic Metres.	Percentage of Carbonylferrocyanide.
1,290	0·395	—
2,950	0·760	traces.
5,820	1·321	3·2
9,710	2·155	5·3
11,700	2·310	6·2
15,200	2·470	6·8

It seems from these results that the carbonylferrocyanide is formed with difficulty in the early stages of the reaction, but increases with the ferrocyanide, to finally reach a limit. Hence there seems to be a chemical equilibrium between sulphuretted hydrogen, hydrocyanic acid, ammonia, and carbonic oxide on the one hand, and sulphide of iron, double ferrocyanide of iron and ammonia, ammonium ferrocyanide, and ammonium carbonylferrocyanide on the other.

From what has been stated, it results that any increase in the carbonic oxide in the gas augments the quantity of carbonylferrocyanide in the solution. This fact was confirmed by special experiment; and the natural result is that if the system of self-carburation of water gas in the retorts proceeds as it is expected to do, one may anticipate that the additional production of carbonylferrocyanide will really be attended by loss on the working. The author examined the possible means of utilizing this body; but hitherto it has not been practicable to make much use of it. It forms a beautiful and convenient violet dye; and the entire range of colours from blue to brownish red can be obtained by simply altering the composition of the baths. But, like Prussian blue colours, the carbonylferrocyanide compound will not stand the action of alkalis, and would be spoilt by soap. Possibly it may have certain photographic applications; but with this exception there is nothing to show that a great demand is in store for it.

COMPRESSED AIR FOR INTENSIFIED STREET LIGHTING BY GAS.

A NEAT combination of attachment and lamps for trolley-poles for the gas lighting of tramway routes is shown in the accompanying photograph, which has been forwarded by Mr. Harold E. Copp, the Engineer of the West Bromwich Gas Department. But what is seen, attractive as it is, is not perhaps quite so interesting as what is unseen in connection with these lamps.



However that may be, it should be explained that the tramway trolley-poles are placed in the centre of the road at intervals of between 100 and 120 feet; and to each is fixed, at a height of about 15 feet from the road, two specially constructed lamps, made by Messrs. Falk, Stadelmann, and Co. The lamps were originally intended for high-pressure gas-burners; and in order that they might all be lighted simultaneously from one point, a ½-inch pipe was laid by the 1¼-inch gas service along the centre of the road, and connected to the main as near the middle of the section as possible. The gas-services up the poles are of 1 inch wrought-iron tube, into which is passed through suitable glands a ¼-inch pipe taken off the ½-inch secondary service. The ¼-inch pipe which conveys the compressed air to the burners passes out at the end of the bracket, and is connected by flexible metallic tubing to the top of the lamp. The lamps are of the "Arc" pattern, with elongated globes. The gas is conveyed to the burner by means of one pipe only, on which is mounted a non-corrosive polished metal wing reflector, arranged so that the real outline of the mantle is indistinguishable; the globe appearing to contain a mantle about 3 inches in diameter. The lamps are suspended from ball joints fitted with three external springs, in order to prevent them swinging through too wide an angle.

The burners and air-compressing plant were supplied by the Air-Light Company, of No. 53, Victoria Street, S.W. The system as applied here is not quite the same as the Company had on view at the Earl's Court Exhibition at the end of last year, and which was described in the "JOURNAL" at the time. At Earl's Court, air in volume was used actuated by a fan; in this installation the system is modified somewhat. The air-compressing plant consists of a Pelton wheel water motor, driven by means of a belt and a small rotary air-compressor, which is capable of supplying sufficient air at a pressure of 2 lbs. per square inch for sixty 10-feet burners, with an aggregate illuminating power of about 18,000 candles. The motor is worked with the town's water; and, at about 80 lbs. pressure, it uses 4 gallons per minute. A small gas-engine would be much more economical to run, but a water-motor in this particular instance was found to be more convenient, as the machine is placed in a brickwork chamber, about 5 ft. by 3 ft. by 4 ft. deep, under the footpath, so that the lamplighter has only to operate the lever taps on the lamps, and turn on the water supply.

The motor is stopped at about 10.30 every night, and the gas consumption is reduced by means of a set bye-pass tap to 5 feet per hour. When working without compressed air at this consumption, each burner gives from 40 to 50 candle power on the photometer-bar. These notes will be useful to other gas engineers who may be contemplating a similar high-power lamp installation for the illumination of tramway routes, with simultaneous lighting from one position.

MEETING OF THE ITALIAN GAS SOCIETY.

West's Compressed-Air Machines at Genoa.

OUR pages have recently recorded the annual gatherings of various groups of Continental gas engineers and managers; and we are now enabled, from notes by one who was present, to give a brief account of the thirty-fourth conference of the Italian Gas Society, which was held during three days last month at Genoa. The President was Mr. H. J. Henry, an Englishman who has been for many years in Italy, and who is the Manager at Genoa for the Union des Gaz Company. The opening proceedings were taken up with modifying the different categories of members, and adding a third class of associates—that is, persons who are connected with the gas industry in the way of trade. Then followed a rather warm discussion on a proposal to deal drastically with gas engineers who take an active part in advising or assisting the municipalization of gas undertakings. The great importance of this will be understood when recent Italian legislation in this regard is remembered. Signor Sospisio, the Engineer of the municipal works of Trieste, and Signor Böhm, of the Union des Gaz Company's works at Milan, both of whom have been rather prominent in advising various municipalities, defended themselves with considerable vigour; being strongly opposed by Signor Lebreton, of the Venice Gas Company (concerning which the two gentlemen previously named have recently been advising the Municipality), and by Signor Laeng, of Brescia, and Signor Pouchain, of the Anglo-Romano Gas Company.

On the morning of the second day, the only actual paper that had been contributed was read. It had been prepared by Mr. Henry, and referred to the retort-house working at the Sampierdarena Gas-Works (one of the two works from which Genoa is supplied), where four years ago Messrs. West's compressed-air stoking machines were installed; accessory elevating and conveying plant being put up by Messrs. Graham, Morton, and Co., Limited. Mr. Henry refers to the importance of retort-house work, and contrasts the advantages and disadvantages of ordinary direct-fired beds of retorts; their excessive consumption of fuel being counterbalanced by the difficulty of disposing of surplus coke, the means they offer of being able to use any kind of fuel, even tar, and the maintenance of a low capital account. He then gives figures relating to the working by hand of fire-bar beds of seven oval retorts, 22½ in. by 15 in., and 8 ft. 3 in. long. He contrasts the results on these beds for the year 1900, before any great movement took place on the part of the stokers, with the results of 1904, after their wages had been increased and their hours reduced from twelve to eight. This comparison affords a striking illustration of the state of affairs in the Genoa retort-houses:—

		In 1900.		In 1904.
Coal carbonized per bed per 24 hours . .	kilos.	4212	..	3909
,, ,, per charge	,,	150	..	139·60
,, ,, per stoker	,,	1684	..	1303
,, ,, cost per ton	lire	2·50	..	3·91
	(say)	2s. 0d.	..	3s. 1d.

"Here," says Mr. Henry, "you have an interesting comparison which shows the double necessity to-day of having to pay more in order to obtain less." The increased cost of carbonizing per ton of coal is at the rate of 56·4 per cent.; and if sick pay and other items were taken into account, the cost per ton would be, for the year 1900, 2·67 lire (2s. 1d.) and for 1904, 4·38 lire (3s. 8d.), or an increase of 64 per cent. Under such circumstances as these, Mr. Henry may well preface his figures relating to the working of West's machines by saying that they have worked very satisfactorily, and adding that they require very slight repairs. "But on account of the very difficult moment, as regards the workmen, at which the machines were introduced, and contrary to the results they have given abroad, they have to a large extent failed in the direction of economizing the staff; while, on the other hand, they give a valuable guarantee as to the weight of the charge." Here there seems to be an extraordinary confession—that because stoking-machines were introduced at the time of labour troubles (which is the usual and most appropriate time for their introduction), therefore this is an excuse for allowing such unimpeachable and world-widely adopted machines to be smothered and swamped by the crowd of stokers weakly allotted to them. Here are Mr. Henry's figures resulting from such a policy; and it may be added that the two pairs of machines serve eighteen through arches of nine retorts, 22 in. by 18 in., and 20 feet long, but stopped in the middle.

Coal carbonized per double arch per 24 hours, kilos.		13,320	(13 tons 2¼ cwt.)
,, ,, per through retort	,,	370	(7·28 cwt.)
,, ,, per stoker	,,	2664	(2 tons 12½ cwt.)
,, ,, per man including coke carriers	,,	1903	(1 ton 17½ cwt.)
Cost of retort-house labour per ton	Lire	2·63	(say 2s. 1d.)
,, ,, air compressor ,, ,, ,, ...	,,	0·43	(,, 4d.)
,, ,, coal carrying and elevating ,, ,, ,, ...	,,	0·65	(,, 6d.)
Total per ton . .	Lire	3·71	(say 2s. 11d.)

If insurance payments were also added, the total cost of machine carbonizing at Genoa would be 4·05 lire, or about 3s. 3d. per ton.

Mr. Henry then proceeds to make some calculations relating to the amortizement of capital and the economy resulting from regenerative furnaces; a good word being spoken for the Derval producers and regenerators at Sampierdarena, the fuel for which does not exceed 14 per cent. Lastly, the author adopts the curious course of giving five replies to a circular sent by him to the Manager of the Mulhouse Gas-Works, to someone described as "the Gas Manager of Berlin," and to the three contracting firms of the Stettiner-Chamotte Fabrik, MM. Lachomette, Villiers, et Cie., and to M. Derval, of Paris. The replies, however, contain nothing of any importance to merit repetition.

In the discussion that followed Mr. Henry's paper, Signor Tosatti, the Engineer of the Gas Company at Genoa, Signor Sospisio, Signor Böhm, and others, took part. The first named also gave some explanations of the plant at the Sampierdarena works, particularly as to the method adopted for increasing the gas pressure in the town by a gas-engine-driven fan at the works. M. Derval, on being invited by the President, offered some few remarks as to the suitability of certain forms of retorts, suggesting the adoption of a deep oval shape (say, about 18 in. wide by 28 in. deep); the idea being to save labour by heavy charges of 8 or 12 hours, and also to produce a semi-metallurgical coke. This suggestion, it may be noted, is rather on the same lines as that in M. Verdier's paper on the carbonization of coal, which he read at the recent French Congress. After some discussion, initiated by Signor Pesce, of Genoa, on the best position for ascension-pipes and hydraulic mains with inclined retorts, Signor Sospisio gave a description of his works at Trieste, which have both inclined retorts and water-gas plant. A few words from the President closed the technical part of the programme.

The afternoon was well spent in a thorough inspection of the Sampierdarena works; and in the evening the annual dinner was held. The following day, the Union des Gaz Company acting as hosts, a very enjoyable time was passed in a sea trip to Rapallo, where luncheon was served and the usual toasts were honoured.

THE ACTION OF GASES UPON FIRE-BRICKS.

By THOMAS HOLGATE, F.C.S., M.Inst.C.E.

When mentioning, in 1902, before the Institution of Gas Engineers, the action of reducing gases upon fire-bricks, and especially upon the iron contained therein, I confined myself to a statement of a few of the facts within my own experience, and the general chemical behaviour of the gases concerned. These were in agreement, and pointed to the desirability of all bricks used in water-gas carburettors and superheaters being as free from iron as possible. The destructive action of carbon monoxide upon fire-bricks then referred to is not due to fusion following a high temperature, but to a combination of influences which it is the aim of this article to elucidate.

The immediate incentive to a more exhaustive study of the subject was furnished by a recent account of the destruction of the upper portion of the fire-brick lining of a blast-furnace in Easton, Pennsylvania. The gases of the blast-furnace, like those of a water-gas plant during a run, contain a large percentage of carbon monoxide—the average in the former being about 26 per cent. Mr. Frank Firmstone, the Engineer, states that the furnace, 18 feet diameter and 75 feet high, was put into use in May, 1902, and by March, 1903, he was compelled to shut it off, because for a height of 20 feet from the top the lining had disappeared. The lower part of the furnace, subjected to oxidizing influences, to slag, and to high temperature, had not suffered abnormally; but it was in the intermediate zone and the cooler portion where

the destruction had been greatest. The lining consisted of fire-clay blocks, 14 inches long and 6 inches thick, backed with 2 inches of loam, then 14 inches of fire-brick work, red brick, and 2 inches of slag wool against the plates. By March, 1903, the blocks had disappeared; and in a few weeks more the fire-brick and the red brick had also gone.

This complete loss of the bricks affected, made it impossible to produce absolute proof of the engineer's view that the disintegration was caused by carbon deposition; but the analysis of the adjacent bricks compared with those of the original bricks, furnished collateral evidence in favour of his explanation. The 9-inch bricks between 30 and 40 feet from the bottom were sintered together as one homogeneous mass; the joints, which were scarcely visible, having been composed of ground fire-clay and crushed brick of the same make as the bricks and blocks. The surface was glazed about 1-16th to 1-32nd of an inch thick; and this skin was analyzed, showing a distinct accession of both alkalies and iron. The fracture of the body was like bluish-grey porcelain, with nearly black spots; but no deposit of carbon was found. Stoppage of the supply of coke to the furnace on several occasions had led to "scaffolding," which by causing the gases to flow in channels may have favoured concentration on the lining, and induced carbon deposition. The impregnation of the bricks with metallic iron may have been effected by iron carbonyl; but this is only one out of several possible alternatives.

The following table contains the results of the analyses of the bricks injured at Easton:—

Constituent.	Original Brick, 1902.	Sintered Brick from Lower Zone.		
		Body of, 1903.	Joint of.	Glazed Skin of.
Silica (SiO_2)	55·62	57·63	..	40·23
Alumina (Al_2O_3)	38·55	31·64	..	12·22
Total	94·17	89·27	..	52·45
Iron peroxide (Fe_2O_3)	4·17	None	..	None
,, protoxide (FeO)	None	3·73	6·60	11·93
,, (metal) (Fe)	None	1·51	..	None
Lime (CaO)	0·24	0·24	..	10·92
Magnesia (MgO)	0·24	0·11	..	4·31
Potash (K_2O)	0·95	2·59	2·39	9·39
		0·59 Zinc oxide		
Soda (Na_2O)	0·29	0·51	0·79	8·43
Total fluxes excluding iron	1·72	4·04	..	33·05
Total iron	3·10	4·41	4·62	9·28
Total accounted for	100·06	98·55	..	97·43

Note.—The point to be noticed in comparing the analyses of the sintered brick with the original is the increase in iron and alkalies both capable, along with the extra lime, of distinctly increasing the fusibility of the brick. Yet, notwithstanding this, it was more durable than the bricks above, subjected to a reducing atmosphere and a lower temperature.

Mr. Firmstone refers to somewhat similar experiences recorded by Mr. Pattinson, of Newcastle-on-Tyne, respecting blast-furnaces in Cleveland, and to several others in "Stahl und Eisen," as having occurred on the Continent, in all of which the explanation was given that the gases had reduced the iron oxides in the fire-brick, and deposited there fine carbon. In addition, recent experience has shown that where dusty iron ore is smelted, there is greater danger to the brickwork; and in this particular too the Cleveland instance corroborates, while again in several American furnaces the ironwork as well as the brickwork has been noticeably attacked.

The following is a very condensed summary of Mr. Pattinson's observations upon the disintegrated bricks in the upper part of the two furnaces, each 85 feet high and 27 feet in diameter. The fire-brick lumps obtained from two works in the Durham district had the composition originally as Nos. 1 and 2 of the subjoined table. The samples of carbon disintegrated brick were obtained from three places, E, F, G, respectively 39, 45, and 67 feet above the hearth line. The sample F was so disintegrated as to be easily crushed to a powder, like fine sand, between the finger and thumb. It was a dark grey colour, and in appearance very like a piece of dark coke. The outer edge of the piece selected for analysis was impregnated with alkaline salts, which cemented the brick together at this part, but only the easily crumbling parts were analyzed. Sample G, from about the highest part of the furnace, where serious disintegration had taken place, was much broken up and burst by the carbon deposit, but could not be crushed between the finger and thumb like F.

The late Sir Lowthian Bell has shown that when blast-furnace gases of varying composition at different heights of the furnace are brought into contact with oxide of iron at temperatures ranging from about 400° Fahr. to a red heat, the carbon monoxide is decomposed, with ultimate formation of carbon dioxide and solid carbon. In one of his experiments, he exposed to the action of this gas pieces of pumice-stone which had been steeped in a solution of sulphate of iron and afterwards calcined. This substance, when thus prepared, would be in a condition analogous to fire-brick—both being silicates through which fine particles of oxide of iron are diffused; the proportion of iron preponderating in the pumice-stone. The result of the exposure to carbon monoxide was that in nine hours an amount of carbon was deposited

Analyses of Bricks, &c., from Blast-Furnaces, Cleveland.

Constituent.	Original Brick. No. 1.	Original Brick. No. 2.	Damaged Brickwork.		
			From 39 Feet. E.	From 45 Feet. F.	From 67 Feet. G.
Silica	55·70	60·47	48·10	55·67	55·60
Alumina	35·50	31·50	26·47	30·00	35·40
Total	91·20	91·97	74·57	85·67	91·00
Peroxide of iron	4·00	3·10	none	3·00	2·67
Protoxide of iron	—	—	1 32	—	—
Lime	0·37	0·37	0 10	0·23	0·34
Magnesia	1·21	0·89	0 86	0·95	1·22
Potash	2·60	2·45	8·32	5·30	2·10
Potassium chloride	—	—	6·19	—	—
Soda	0·45	1·25	1·05 H_2O	1·67 Chlorine	0·42
Other substances	—	—	1·03	0·04	—
Fluxes exclusive of iron	4·63	4·96	16·52	8·19	4·08
,, inclusive ,,	8·63	8·06	17·84	11·19	6·75
Carbon	—	—	5·97	3·24	20·5
Total accounted for	99·83	100·03	99·32	100 10	99·80

equal to 770 parts of carbon for every 100 parts of iron in the pumice. So likewise in the sample of disintegrated fire-brick taken from E the carbon was found to iron in the proportion of 581 : 100. A careful examination of the bricks showed that many had contained a number of black iron spots; and it was on these that the greatest amount of carbon was found. Little nests of ferruginous carbon, often about the size of horse beans, were found on the places corresponding to these spots; and the accumulation of carbon in some cases had apparently grown so large as to split the brick, and thus to open it to the more ready passage of gas. Some of the bricks had only carbon deposited in these nests; but where the action was more fully developed, every particle of the brick seemed impregnated with carbon, and the whole changed to a crumbling and disintegrated mass. The carbonaceous deposit formed on the iron spots was examined, and found to contain 84·9 per cent. of carbon and 15·1 per cent. of ash, chiefly oxide of iron. An attempt was made to obtain a larger quantity of the deposited carbon on the iron spots; and the analysis of this is appended. It shows admixture with brick, and iron is associated with carbon in the proportion of 100 parts of iron to 1875 parts of carbon. The potash also is approximately three times that of the original brick compared with the silica and alumina: Carbon, 57·76; iron, 3·08; silica, 19·65; alumina, 12; lime, 0·28; magnesia, 0·51; potash, 2·43; soda, 0·63; sulphuric acid, trace; sulphur, 0·44; moisture, 2·60—total, 99·38.

When summarizing the practical conclusions, Mr. Pattinson said: "All the circumstances elicited appear to indicate that, in selecting for use in the blast-furnace bricks which shall be able to resist as much as possible the disintegrating action of gases, those coming nearest to the following conditions should be chosen: First, they should contain as little oxide of iron as possible; secondly, they should be free from iron spots; and, thirdly, they should be close in the grain or texture, so as to prevent the ready passage of gas through the pores."

The analyses of bricks taken at E, F, and G show in the first case a larger percentage of deposited carbon, though there was less disintegration than at E and F higher up in the furnace, and normally exposed to a lower temperature. The differences, too, in the percentages of alkalies are important.

Sir Lowthian Bell explained the difference between carbon present as a surface coating exposed to a high temperature and to oxidizing influences and high temperature, and the loosely formed carbon deposited by the action of carbon monoxide at about 300° to 500° C. After having expressed his agreement with Mr. Pattinson's explanation of the disintegrated brickwork, he said: "It was really extraordinary how long a blast-furnace was able to maintain its working condition in the face of such destructive agencies as those which prevailed in its interior. If any chemist were shown a fire-brick, and informed that if it were plunged into the slag runner in less than a quarter of an hour the whole substance was melted, probably one of the last materials he would suggest as a lining for a furnace would be fire-brick. Yet they knew that, notwithstanding the action of 100 tons a day passing through the hearth, furnaces did endure this resistance to the corroding action a long time. He could only account for it in one way. The dissociated carbon which formed the subject of Mr. Pattinson's inquiry he believed to be the protecting agency at work in the blast-furnaces which, providing a coating, preserved the furnace itself. It was quite a well-known fact to all blast-furnace managers that, when a furnace began to run on a 'scouring cinder'—that was to say, a black cinder containing a considerable quantity of oxide of iron—they knew very well that the lower part of the hearth was immediately affected. This slag containing a quantity of oxide of iron at once attacked the carbon forming the coating in the lower portion of the furnace; and the moment that protecting coat of carbon was removed, the 'cinder' commenced that action on the brick itself, with the partial destruction of the furnace."

(To be concluded.)

THE MIDLAND JUNIOR GAS ENGINEERING ASSOCIATION.

Last Thursday, in the Council Room of the Birmingham and Midland Institute, a general meeting was held to consider the rules framed by the Provisional Committee for the newly-formed Junior Gas Association for the Midland Counties, and to elect the first officers of the Association. There were a large number of members present; and during the first portion of the proceedings the chair was taken by Mr. THOMAS BERRIDGE, of Leamington (President of the Midland Association of Gas Managers), while Mr. Charles Meiklejohn, of Rugby, was present in his capacity of Honorary Secretary *pro tem.* to the new Association.

Mr. BERRIDGE, at the outset, announced that the Committee of the Midland Association of Gas Managers had had an interview with Dr. Sumpner, and he had agreed to form "Gas Manufacture" classes in connection with the Technical School, to be held during the six winter months. Something like fifty men in Birmingham and twenty from the neighbouring towns had already announced their intention of joining the classes, and thus taking advantage of the excellent opportunity which has arisen in that district for acquiring technical knowledge.

THE RULES.

Mr. MEIKLEJOHN read the rules suggested by the Provisional Committee. These were to the effect that the Association should be called the Midland Junior Gas Engineering Association; that there should be honorary and ordinary members (the former not to exceed in number one-half of the latter); and that the subscription should be 5s. a year. The qualification was to be: "Any person holding a recognized official position who is engaged at a gas-works or at works dealing with the working up of gas-works residual products, or otherwise associated with gas manufacture and distribution, but who is not engaged in the manufacture of gas appliances." The last-named provision was also to apply to the honorary members. The Council was to consist of a President, two Vice-Presidents, an Honorary Secretary and Treasurer, and six other members—all to hold office for one year and to be eligible for re-election; the ex-President of the Association and the President and Hon. Secretary for the time being of the Midland Association of Gas Managers to be *ex-officio* members. The retiring President to be succeeded by the Senior Vice-President.

Mr. BERRIDGE remarked that the rules had been gone through very carefully by the Committee; and he thought they might be adopted all together.

Mr. G. F. TWIGG (Derby) said it seemed to him that, instead of the whole Committee retiring annually, it would be better for a portion only to do so. This would ensure some sort of continuity in the management of the Association.

Mr. MEIKLEJOHN suggested that the Midland Association rule would meet the case. They had the same number of officers; but instead of all the members of the Committee retiring annually only two did so, and they were ineligible for re-election. In this way, there were always four members on who had a knowledge of what had been done previously.

This having been agreed to,

Mr. BERRIDGE moved the adoption of the rules as read by Mr. Meiklejohn, subject to the amendment named.

Mr. G. W. G. TATAM (Birmingham) seconded; and the resolution was unanimously carried.

ELECTION OF OFFICERS.

Mr. BERRIDGE said the next business was the election of officers. The Committee had gone into the matter; and they suggested Mr. F. J. Bywater, Assoc.M.Inst.C.E. (Birmingham) as President, Mr. G. W. G. Tatam (Birmingham) as Senior Vice-President, and Mr. W. E. Caton (Derby) as Junior Vice-President.

Mr. A. W. SMITH (Birmingham) proposed, and Mr. J. H. DARRAH (Birmingham) seconded, the election of Mr. Bywater as President; the former remarking that the choice was an excellent one, as Mr. Bywater had had considerable experience in the construction of works.

The motion having been enthusiastically agreed to,

Mr. BYWATER, on taking the chair, briefly returned thanks for the honour done him by electing him President. He said that the first year of the Association was more or less a time during which the eyes of those engaged in the gas profession in the district would be upon them; and therefore it was a time which would call for the greatest loyalty, not only of the officers, but also of the members. He therefore appealed earnestly to them all to lend their most earnest support, both in regard to attendance at the meetings and the provision of suitable papers for the Association. He concluded by proposing the appointment of Mr. Tatam and Mr. Caton as Senior and Junior Vice-Presidents respectively. The former gentleman was a highly qualified Chemist; and though he did not unfortunately know Mr. Caton personally, he had been very well spoken of by Mr. Berridge.

The motion was seconded by Mr. J. H. WILLOUGHBY (Leamington) and unanimously agreed to.

On the proposition of Mr. TATAM, seconded by Mr. A. N. COMELY (Birmingham), Mr. James Hewitt, of Birmingham, was appointed Hon. Secretary and Treasurer.

On the motion of Mr. A. O. JONES (West Bromwich), seconded by Mr. H. E. TEMPLE (Birmingham), the following were elected members of the Committee: Messrs. A. W. Smith, Birmingham; F. P. Dyson, Loughborough; J. H. Willoughby, Leamington; L. Wilson, Stafford; G. Shepherd, Banbury; and S. T. Smith, Walsall; with Mr. Berridge and Mr. Meiklejohn as *ex-officio* members.

THE SERVICES OF THE MIDLAND ASSOCIATION ACKNOWLEDGED.

Mr. BERRIDGE said he regretted that, owing to another engagement, he could not remain longer at the meeting. He wished them all possible success, and assured them that he should be glad to do anything in his power to help them. He was sure also that the other members of the Midland Association would do what they could to assist the juniors. He hoped the Association now started would prove a very great benefit to the young men in the Midlands, and also to the gas industry in general.

Mr. BYWATER remarked that, before Mr. Berridge left, he should like to propose—"That the thanks of the first meeting of the Junior Association be extended to Mr. Berridge, as President, and Mr. Meiklejohn, and also to the members of the Midland Association, for the kindness they have shown in the formation of this Association." Had it not been for Mr. Berridge, and the way in which he had taken the matter up, the Association would not have been formed; and he was sure they all felt the kindness they had received.

Mr. TATAM, in seconding, said they were all very much indebted to Mr. Berridge, and they would hope to see him at their subsequent meetings.

Mr. BERRIDGE, in response, remarked that the best thanks they could give him would be to make the Association a very great success. He hoped some day soon they would do him the honour of visiting his works at Leamington.

TIMES OF MEETING.

Mr. BYWATER asked for an expression of opinion as to the number of times during the session—which it was proposed should extend from October to April—meetings should be held, and the most suitable hour. The Committee had spoken of once a month; and he thought this would be the most generally acceptable arrangement.

After some discussion, it was agreed that the meetings should be held the first Saturday in each month during the session, at 3.30, the first annual meeting to take place in October.

In reply to a remark by Mr. A. O. JONES (West Bromwich) that once a month might be too often for them to find papers,

Mr. BYWATER pointed out that, in addition to papers dealing with gas matters, they hoped to get a fair number from gentlemen engaged in working up residuals. Then, again, they were not bound down to take papers from members only. There were a large number of people available in Birmingham who he felt sure would be willing to place before the Association their views on the construction of various kinds of gas plant, &c. He did not therefore think there would be much trouble in securing the necessary number of papers. He hoped that outside men would not think the Association was being run for the benefit of those in Birmingham. The Birmingham members were most anxious to take the lead; but this was for the purpose of helping the Association, and not for their own personal gratification. He trusted therefore that loyalty would extend right away to the utmost limits of the Midland Counties, and that outlying members would do their best to attend the meetings and give the Association the benefit of their ideas by contributing papers.

Mr. TATAM said the Birmingham contingent were connected with the gas-works in the centre round which the Association had been formed; and they naturally thought they were handiest there to attend to matters.

A VOTE OF THANKS TO MR. MEIKLEJOHN.

Mr. TATAM proposed a hearty vote of thanks to Mr. Meiklejohn for the great work which he had done in bringing the Association to such a successful conclusion—or rather start. He had been untiring in his efforts, and he had given up a lot of his spare time to the formation of the Association.

Mr. CATON seconded the proposition, which was cordially agreed to.

Mr. MEIKLEJOHN said he was very much obliged for the kind words in which Mr. Tatam had proposed the vote of thanks to him. He could merely assure them, as he said at the preliminary meeting, that he counted it not only a pleasure but a privilege to give the Association a start. If in the future he could do anything to forward the interests of the members, it would be only necessary to know in what direction he could do it, for him to give his most hearty assistance.

The Coal Distillation Company of Gelsenkirchin last year made a net profit of only £6271, against £8825 in 1903—strikes having interfered with business. The output of coke was 72,400 tons; benzol products, 2341 tons; tar, 1873 tons; sulphate of ammonia, 991 tons; and sal-ammoniac, 14 tons. The number of coke-ovens with ammonia-recovery plant has been raised from 60 to 120.

GAS-PRODUCER POWER PLANTS.

At the Annual Meeting of the American Institute of Mining Engineers, a paper on the above subject was read by Mr. S. S. WYER, of Columbus (Ohio). The following extracts are taken from the paper as printed in "Engineering Record."

The manufacture of producer gas is an old process, and gas-engines have been developed to a very high stage of mechanical efficiency; hence there is no valid reason why such installations should be regarded as experimental. No gas-producer power plant can be successful unless the gas-engine is adapted to suit the particular gas available for its use. An engine which will develop 100-horse power with natural gas will give only about 80-horse power with producer gas—a loss of 20 per cent. With a 200-horse power engine this loss would be about 15 per cent.; and with sizes above 300-horse power it would be about 10 per cent. Hence the obvious necessity of designing the engine to suit the particular fuel it is to use. Several failures have resulted from neglecting this important point. The following data relative to the design, operation, and maintenance of gas-producer plants are given to show their advantages.

A good gas-producer, from the very nature of its construction and operation, does not allow the smoke to escape into the atmosphere; hence it presents a practical solution of the smoke problem. The non-requirement of a chimney means a large saving in first cost and in the maintenance of a power plant, and is an additional advantage in plants where the æsthetic features of the design are of importance—for example, in the case of a municipal power plant. The cost of labour to operate a gas-producer plant is about the same as that required in a steam plant of similar size. However, during the time that the former plant is idle, it requires less attention than does a steam-boiler.

In the case of a municipal pumping-station, the labour needed for working the producer-gas plant would be one-half that of a similar steam plant; the gas plant being operated as follows: Supposing the gas-producers to use coal for supplying the gas to work a three-cylinder vertical gas-engine direct-connected to a triplex double-acting power pump, the usual fire-engine will be dispensed with, and, should a fire occur, the requisite pressure will be obtained by pumping directly into the system. For ordinary domestic supply, the pump will deliver the water into a water-tower, from which the mains receive the supply as needed. In every case the maximum quantity of water required during a fire is much larger than the average domestic consumption. Hence the pump must be designed for this maximum quantity. As a result, the working of the pump at its full capacity for 6 out of 24 hours would furnish enough water for the daily domestic consumption. The pump would usually be operated from 7 to 10 a.m. and from 3 to 6 p.m. A gasholder of sufficient capacity to run the pump for 30 minutes is to be filled before the producers are closed down. Compressed air is to be used to start the engine, which may be put in motion simply by moving a lever. The engineer has to live adjacent to the plant, so that when an alarm is sent in to the hose company, and simultaneously to the engineer's house and to the plant, it would be possible for the engineer to have the pump at work direct into the system by the time the fire company could reach the fire and make the hose connections. Since the gasholder would supply the engine until the producers could be started, the above scheme of operation eliminates the necessity of a night fireman and the keeping up of at least 70 lbs. of steam pressure in a steam plant. A similar arrangement could be equally well adapted for fire purposes in connection with large industrial plants.

With regard to the skill needed, a producer-gas power plant does not require any greater skilled labour than does a steam plant of similar size. However, in some cases, it may require time for men trained to handle steam apparatus to become accustomed to gas-engines and gas-producers.

Two well-known engineering concerns give the following data concerning the cost of installation: "The cost of gas-power plants, including gas-generating plant and gas-engines, up to 500-horse power, is about 25 per cent. higher than the cost of a steam plant of similar size. Large plants from 1000-horse power upwards cost about the same as a first-class steam plant of similar size." The cost of repairs on a gas-producer plant will not exceed that of a boiler plant.

In order that a gas-producer plant shall be commercially successful, it must be equal to making, from a low-priced fuel, gas that is sufficiently clean for use in an engine. Bituminous slack is usually the lowest-priced fuel to be had. However, anthracite, culm, or even wood, may be cheaper in some localities. In all cases the percentage of sulphur must be low if the gas is to be used in an engine. Frequently the use of a mechanically washed coal will be economical. The only reliable way to remove tar and other hydrocarbons from gas made from soft coal is to have the producer so arranged that the gas comes in close contact with an incandescent mass of carbon. No mechanical means have yet been found successful, though several forms of centrifugal apparatus have been tried. To remove fine dust particles, however, centrifugal fans have proved very satisfactory.

The stand-by loss of heat is very small, being limited to radiation only. A gas-producer is tightly closed during the time it is not making gas, and the entrance of air is thereby prevented. This feature gives it a marked advantage over a steam-boiler under similar conditions. Even after a producer has been idle for several hours, it may be started and can be working at its full capacity within 15 minutes. In connection with the producer a gasholder is generally used, from which a supply of gas can be taken to start the gas-engine instantly, and keep it in operation until the producers are making gas. A producer may be stopped instantly by simply shutting off the supply of air and steam. The gas from the producer is quite uniform in composition; and as it usually passes first to a holder before reaching the engine, it becomes thoroughly diffused—thus ensuring a still greater uniformity. The thermal efficiency of gas-producers is generally about 80 per cent., and in some cases it is even higher.

It is much easier to use an automatic feeding device on a gas-producer than on a steam-boiler, because all producers are placed vertically, and the fuel can be dropped into position by gravity. The use of an automatic feed always decreases labour and ensures more uniformity in the composition of the gas produced. The rate of gasification in a producer is relative to the character of the coal used. The best rate determined by experience is 12 lbs. of coal per square foot of grate area per hour, though some makers have advised as much as 20 lbs. of coal.

The amount and frequency of poking a gas-producer will depend upon the nature of the fuel and the design of the producer. The mechanical agitation of the fuel-bed entirely does away with poking. In using bituminous coals, the difficulties of clinker formations are augmented by the production of coke. The judicious use of a steam-blast and automatic feeding will generally reduce poking to a minimum, and in some cases will eliminate it entirely. Hand poking is very laborious for the attendant, and it will usually be shirked whenever possible. Gas will escape around the holes while the producer is being poked, which will vitiate the air in the producer room and also affect the regularity of the composition of the gas.

The calorific value of producer gas varies from 125 to 150 B.T.U. per cubic foot. The generation of one brake horse power per hour with from 1 lb. to 1·25 lbs. of coal or 3 lbs. of wood is very common producer-gas power-plant practice at the present time; and the gas contains at least 80 per cent. of the heat energy resident in the fuel.

A very important advantage of the producer-gas installation is that the gas does not condense or lose power on its way to the engine. On the contrary, the cooler the gas the better it is for the engine. With steam, the condensation is considerable. It is easy to prevent leakage of gas from the piping, owing to the low pressure of the gas (about 2 inches of water); whereas with steam there is often much loss and inconvenience on this account. By using isolated engines, a large saving in shafting may be made in many cases. It is not possible to do this in steam plants and still maintain good economy. The floor space needed for gasholders, gas-producers, and auxiliary apparatus is about the same as that required in a steam plant. The holder, however, need not be placed adjacent to the producers, but at any other convenient place. A gas-producer plant is under much better control than the average steam plant, because in the producers the air supply rate of gasification as well as the fuel supply can be regulated more easily.

One of the most potent advantages of the gas-producer plant compared with the steam plant is the ability of the former to store the heat energy in a holder where it may be drawn upon for immediate use. In this way irregularities and fluctuations of load need not affect the regularity of the action of the producer. This condition means an economy of operation and convenience of use which are impossible with any steam plant. Another important advantage of the producer plant is that in many cases the gas may be employed both for power and metallurgical purposes; the same pipes being used to supply engines and furnaces.

In many cases it is a serious matter to secure a sufficient supply of water for a steam plant, and sometimes, even with an adequate supply, the quality of the water is such that it is entirely unfit for use in a steam-boiler. One of the most annoying difficulties of many steam plants is the trouble caused by the corrosion and subsequent cleansing of the boilers, together with the maintenance of feed-water purifiers. The gas-producer power plant forms an almost ideal solution of the problem of water supply. With a producer in normal condition, the consumption of water will not exceed 2 lbs. per brake horse power. The water used in cooling the gases in the scrubber may be cooled in a simple tower and used repeatedly.

There is no difficulty in piping the gas for several thousand feet in order to reach an engine driving an isolated machine. This often makes it possible to dispense with abnormal lengths of line shafting, and the consequent loss by friction or other unsatisfactory methods of power transmission. This condition is especially valuable where electrical power is not used.

Standard gas-producers now range from a few horse power to more than 500-horse power in size. There is less danger of explosion in a gas-producer plant than there is in connection with a steam plant; moreover, should an explosion occur, it would be much less violent and destructive than that of a steam-boiler. If desired, the producer plant may be placed near the fuel supply, which in many cases would reduce the expense of transportation; the gas being piped to the gas-engines or furnaces where it is to be used. This arrangement, which is impossible with a steam plant, means a decided saving in favour of the gas-producer installation.

THE RADIO-ACTIVITY OF THORIUM.

THE luminosity of the incandescent gas-mantle devised by Dr. Auer von Welsbach is known to be affected by the proportions of thorium and cerium present in the impregnating salts; but what is the immediate cause of the phenomenon has not yet been established. Whether the thorium and cerium are themselves the active agents, or whether they are accompanied in minute quantity by bodies of unknown composition, is as yet uncertain. The inquiry into the behaviour of these bodies has been greatly quickened by the discovery of radium by M. and Mme. Curie, and the subsequent discoveries of Ramsay, Rutherford, and Soddy as to the helium emanation. It is now being recognized that thorium is either a conspicuously radio-active element, or that it is (according to Dr. O. Hahn) accompanied by a substance more active than itself. The investigations of the scientific men quoted below, and others labouring upon this subject, lead us to hope that the problem of thorium activity will ere long be solved, with consequent gain to all those who are dependent upon its practical applications. The academic labours of Dr. Auer von Welsbach were not long in advancing the fortunes of gas lighting; and we see no reason to doubt that equal triumphs are yet in store for those who overcome the many difficulties which these rare earths and their occult behaviour interpose.

The general knowledge upon the subject, as stated by Dr. W. Hampson, has hitherto been as follows: If thorium nitrate be dissolved in water and then precipitated by ammonia, it is found when collected to have lost practically all its radio-activity. On the other hand, the solution is radio-active; and the small residue remaining after subjection of that solution to heat is as radio-active as the original thorium. This minute quantity is a new substance formed by the disintegration of the thorium atoms, and, in the absence of further knowledge, is called "thorium X." It is constantly being produced and stored up in the thorium salt, and is then separated by the precipitation with ammonia. Next to the fact that the thorium X possesses all the radio-activity, and that the thorium has lost it, is the remarkable fact that the thorium X at once begins to lose, and in three weeks has lost, it all; while the thorium which had lost it begins at once to recover, and in three weeks is as strong as ever. The explanation is that thorium has constantly some of its atoms breaking up into another form of matter—thorium X. But again the atoms of thorium X undergo a further disintegration, accompanied by the usual evidences of radio-activity in the emission of various rays; and this disintegration is the production of a material called "emanation."

The Hon. R. J. Strutt, Fellow of Trinity College, Cambridge, has quite recently made an investigation into radio-active minerals, especially of those containing thorium. In his communication to the Royal Society, he says that thorium seems to be invariably accompanied by uranium and radium. Uranium-radium minerals free from thorium are to be met with, but never, as far as his experience goes, the converse. The ratio which is given in the subjoined table varies within wide limits; but still the fact of the association of these rare substances seems to be suggestive. Thorium is radio-active; it is therefore presumably changing into something. Helium is probably a product, and similarly uranium; and it is quite possible that one of the cerium metals, not uranium, is the next fairly permanent descendant of thorium, for these metals are almost, if not quite, always found with it.

Mr. Strutt summarizes his conclusions from this preliminary

Table Compiled from the Hon. R. J. Strutt's Researches on Thorium Minerals.

Mineral.	Locality Where Obtained.	Thorium Oxide. Per Cent.	Thorium—Emanating Power. Arbitrary Scale.	Helium. Cubic Centimetres per Gramme.	Radium Bromide. Millionths of 1 Per Cent.	Uranium Oxide (U_3O_8). Per Cent.	Total Activity, Uranium Oxide Taken as Unit.	Ratio of Uranium to Radium.
Thorianite*	Ceylon	77·0	588	8·90	30·4	13·00	2·48	2·34
Orangite	Brevig	48·5	242	0·11	2·82	1·00	1·07	2·82
Gadolinite	Ytterby	8·6	50	2·43	11·70	2·94	0·38	3·98
Æschynite	Ural Mountains	8·18	40	0·98	9·90	2·50	0·249	3·99
Cyrtolite	Llano County, Texas	5·05	1248	1 15	8·98	3·67	0·468	2·45
Sipilite†	Little Friar Mountain	4·92	140	0·59	8·82	2·86	0·514	3·08
Monazite	Virginia	2·43	144	1·57	0·806	0·10	0·101	0·80
Euxenite	Arendal, Norway	1·96	208	0·73	5·56	2 84	0·245	1·96
Monazite	Brazil	1 54	2·7	0·81	0·288	..	0·0954	..
Samarskite	North Carolina	1·46	5·0	1·50	22·50	10·3	0·495	2·18
Æschynite	Hitteroe	1·26	3·0	1·09	24·09	9·42	0·606	2·54
Monazite II.	Norway	1·21	610	2·41	0·275	..	0·373	..
,,	Fahlun	0·80	688	1·40	0·323	..	0·884	..
Monazite I.	Norway	0·65	217	1·54	2·35	1·00	0·316	2·35
Pitchblende	Joachimstahl	none	..	0·107	153·00	73·50	3·11	2·10
,,	Grampound Road, Cornwall	,,	..	0·10	48·50	21·23	1·17	2·28
Cuprouranite	Cornwall	,,	..	0·10	120·00	60·00	2·00	2·00
Pitchblende	,,	,,	..	0·08	60·60	29·15	0·867	2·03
Microlite	Virginia	,,	..	0·05	3·70	1·89	0·101	1·96
Pyromorphite	Issy L'Évêque	,,	..	0·02	4·39	..	0·0655	∞
Carnotite	Montrose County, Colorado	,,	..	0·01	5·27	2·98	0·174	1·76
Kolm	Sweden (bituminous, occurring in alum slate)			..	0·67	0·377	0·0174	1·78

* See "JOURNAL," Vol. LXXXVI, p. 225; also "Nature," Vol. LXIX, p. 510.

† The presence of thorium in this mineral seems to have escaped previous observers.

investigation as follows: (1) The conclusion that the amount of radium in a mineral is proportional to the uranium is confirmed. The investigation of this point has brought to light the existence of uranium in some minerals not previously known to contain it—monazite for instance. (2) It is shown that thorium minerals invariably contain the uranium-radium combination. This observation is difficult to interpret, but it may possibly indicate that thorium is producing uranium. (3) Helium never occurs, except in very minute quantity, unless thorium is present. The helium of minerals, therefore, is probably produced more by thorium than by radium. (4) Thorium minerals vary much in emanating power. Some retain nearly all their emanation, others give off large quantities.

The above table, besides giving analyses of many samples of monazite, used for the preparation of the materials for gas-mantles, shows that the ratio of uranium to radium in them has a less variation than the actual percentage of thorium-oxide (thoria). The second half of the table shows a series of bodies not containing thoria which may be contrasted in their properties with those of the first half, which, starting with thorianite 77 per cent., finish with Norwegian monazite of only 0·65 per cent.

The first substance in the table was fully described in the "JOURNAL" for April 26, 1904, p. 225, and some of the material was further investigated recently by Dr. O. Hahn, and the results brought before the Royal Society. The raw material was provided by Sir William Ramsay as an intermediate product, being the residue remaining, after fusion with bisulphate, of 5 cwt. of the cubical ore of Ceylon, for which "thorianite" has been adopted as a name. From this has been separated a new substance. The oxalate which weighed 10 milligrammes, dissolved in hydrochloric acid gave a quantity of emanation considerably greater than would be evolved from 1000 grammes of thorium in solution; consequently it is more than 100,000 times as active as thorium.

Further work has resulted in the accumulation of 20 milligrammes of material nearly 250,000 times as active as its own weight of thorium nitrate. Thorium itself, if present at all, must be there in minute quantity. Whether this active substance is a constant radio-active constituent of thorium preparations, or whether it is another new radio-active element, remains still undecided; but there are reasons for regarding it as different from emanium; actinium, or the radium emanation. After precipitation of a small part of the solution in hydrochloric acid with ammonia, the filtrate shows considerable radio-activity, which rapidly falls off in a few days, but does not wholly disappear; and the removal of this substance does not diminish appreciably the radio-activity of the insoluble residue. Whether or not this is due to thorium X has not been quantitatively investigated. The close relation of the new body to thorium is proved not merely by the apparent identity of the two emanations, but also by its having been separated from a mineral unusually rich in thorium.

Dr. Hahn cites the observations of N. M. Dadourain and Messrs. Elster and Geitel, who, having found the "thorium emanation" without detecting thorium, conjecture the presence of a new radio-active element; and attention is drawn to the fact that inactive thoria has been said more than once to have been obtained.

It is almost certain that all these emanations are the product of this new substance, and are not derived from thorium itself, for the amount of emanation obtainable from thorium is so small that, if it was possible that it could be measured at all, it should clearly be possible to detect thorium analytically in the source from which it is evolved.

At the first meeting of the Council of the Society of Arts, Sir Owen Roberts, M.A., D.C.L., F.S.A., was elected Chairman for the ensuing year.

THE NEW GAS-WORKS AT ILFRACOMBE.

Inspection of the Works.

In response to the invitation of the Directors of the Ilfracombe Gas Company, there was a large gathering on Friday last at the formal opening of the new works which the Company have built at Hele, and which were fully described and illustrated in the "JOURNAL" for the 4th inst. Many of those present were leading representatives of the public life of the town, and there was also a good muster of gas engineers from different parts of the West of England, from South Wales, and even some gentlemen from Ireland.

Conveyances were waiting at the railway station for visitors arriving by the midday trains, and others picked up the party assembled at the Company's offices, and they were at once driven to the new works. Hele is two miles from the centre of Ilfracombe; and the drive thither affords pleasant glimpses of the beautiful scenery characteristic of the district, and at the same time furnishes evidence of the growth of Ilfracombe, in the extension of its houses and hotels over the hills and valleys radiating from the harbour and business portion of the town. Though the new gas-works constitute a range of imposing buildings covering an area of six acres, it cannot be said that they unduly obtrude upon the scenery of the neighbourhood. They are, in fact, so situated as to be almost hidden from view. When some newly-planted trees have attained a little larger growth, the works will be passed unnoticed by most persons who travel along the road which they adjoin. As it is, even those who were on the look-out for the works could not catch any sight of them until they were close upon them. To Ilfracombe, dependent as it is for prosperity on its reputation for beauty, this is a matter of no little importance. The sites available for gas-works in the locality are few, and the Company have been fortunate in obtaining one which is not only admirably adapted for the purpose, but has enabled them to build without disfiguring a beautiful landscape.

On their arrival at the works, the visitors were welcomed by the Chairman (Mr. R. Lake), and his fellow-Directors, Mr. W. C. Rafarel and Mr. J. P. Ffinch, who, together with the Engineer and Manager (Mr. C. E. Ball), were there to receive them. After partaking of light refreshments in the office, the party made a prolonged and interested inspection of the works. In view of the detailed description which has already appeared, it is unnecessary to say anything about them now. Under the guidance of Mr. Lake, and accompanied by Mr. Priestman, representing the Contractors (Messrs. R. & J. Dempster, Limited), the party first went to the retort-house and coal-store. The admirable arrangement and ample space of these buildings were commented upon. For the benefit of those unfamiliar with them, Mr. Winstanley pointed out the special features of his deep regenerator settings. After witnessing the operation of drawing and charging some of the through retorts, and noting the special features of the furnaces, the party passed on to the exhauster and boiler houses, then to the sulphate works, and to the Dellwik-Fleischer water-gas plant. This installation proved very interesting to the majority of the party. Mr. Dellwik explained the process, and the plant was shown at work through the ordinary operations of the "blow" and "run." The apparent simplicity of the thing, and the ease with which the plant is worked were recognized. From the water-gas plant, the party went on to the purifier and meter houses, and took note of the arrangement of the tar and liquor tanks, the scrubber and washer, the coke yard, the gasholder, and the relief holder for water gas. Finally, in a group, amid the apple trees which remain of the orchard on the site of which the works have been built, the visitors and their hosts were photographed. This concluded an inspection, which, brief though it was in point of time, enabled those who took part in it to see that the works have been admirably planned, the buildings substantially constructed, and that the plant is of the best and most modern type. Mr. Ball, on whom has fallen great responsibility during the construction of the new works, and to whom is due, in large measure, the credit of their completion, has unfortunately been seriously unwell of late. The visitors were pleased to see him at the opening ceremony; and he was heartily congratulated upon the successful carrying out of the undertaking.

INAUGURAL PROCEEDINGS.

Driving back to the town, the party sat down to luncheon at the Ilfracombe Hotel, under the chairmanship of Mr. LAKE. Among the company, in addition to the gentlemen already named, were Mr. Alderman Dix, the Chairman, Mr. D. Irving, M.Inst.C.E., the Engineer, and Mr. J. Phillips, the Secretary of the Bristol Gas Company; Mr. J. Lowe, formerly of Weymouth; Mr. J. C. Clarke, the Chairman of the Ilfracombe District Council; Mr. S. J. Ingram (Truro), Mr. H. E. Riley (St. Austell), Mr. W. W. Callander (Ilminster), Mr. J. Magrath (Cork), Mr. T. Canning (Newport), Mr. Davis (London), Mr. T. Handel (Ilminster), Mr. F. Turner (Chard), Mr. A. J. Ward (Bute Docks, Cardiff), Mr. Hancock (Barnstaple), Mr. R. A. Browning (Neath), Mr. Glover (Paignton), Mr. W. D. Joce (Bideford), Mr. J. F. Bell (Derby), Mr. H. W. Cowling (Sherborne), Dr. E. J. Slade-King, the Medical Officer of Health for Ilfracombe, Mr. O. M. Prosser, the Surveyor to the District Council, Mr. H. W. Weir, the architect, and Mr. T. Upton, the builder of the works. Following the luncheon were a few brief and businesslike speeches.

Alderman DIX, the Chairman of the Bristol Gas Company, proposing "Success to the Ilfracombe Gas Company," said that all who were present had been very pleased to see the Company's new works and what they were doing for the town. The Company were fortunate in having the opportunity to leave the old works for new ones in which everything was up-to-date. In other places they had not this opportunity, and were compelled to do the best they could with what they had. He hoped that by means of new works the Company would be able to light Ilfracombe, not only with pleasure to themselves, but with profit to everyone concerned. The whole of the works were exceedingly pleasant to look at; and they all heartily congratulated the Company on the improvements and the progress they were making. Some years ago, it was said that the electric light was going to supersede gas. This prediction had not proved true; and he was one of those who believed it would not do so. Even if gas should be used rather less for illuminating purposes, it would be utilized more for the production of power. They certainly owed a great deal to the stimulus of competition by the electric light; and he thought that gas could hold its own in the competition. In London electricity for street lighting was being given up in favour of incandescent gas; and in towns where the Corporation did not own the electricity works they would see more and more of this done. At all events, in Ilfracombe they might see in that day's event a happy augury for the future of gas lighting.

The CHAIRMAN, in reply, said that although they had been at great expense in building new works and leaving the old ones, they thought it was the right thing to do. The present Company took over the old works in 1872. Since then very great strides had been made. They put in new plant, but still found the demand outgrowing the means of supply; and by 1885 they were of opinion that it was necessary to obtain more land. Unfortunately, they were opposed by the Local Board of that day, and were compelled to abandon the scheme. The Board obtained power to purchase the gas-works within a certain limited period; but, fortunately for the Company, they did not exercise their powers, as he thought they ought to have done. In 1896 the Company applied to Parliament again for authority to erect works at Hele; and they had the result to-day. They had works which were certainly very nice, and would be quite equal to the requirements of Ilfracombe; and they hoped that the removal of the works would be an advantage to the town.

Mr. J. LOWE proposed "The Trade and Town of Ilfracombe." He said that in proportion to the prosperity of a town was the prosperity of its gas-works; and the extension of the Ilfracombe works was an indication of the prosperity of the town, upon which they were to be heartily congratulated. It was not many of them in the gas profession who were able to start new works as they had done at Ilfracombe. These works would be a lasting memorial of credit and honour to the Engineer who designed them, and they did great credit to the builder and the contractors, who had carried out their part in the most excellent way.

Mr. J. C. CLARKE, the Chairman of the District Council, claimed that Ilfracombe was one of the most up-to-date towns in the kingdom. It was one of the first to go in for incandescent gas lighting. It was at one time a question between electricity and gas for the public lamps. He read all the literature on the subject, and so became convinced, and was able to convince the Council, that incandescent gas lighting was to be preferred to electric lighting. London had now followed the example of Ilfracombe. They had been fortunate in Ilfracombe in having such an excellent body of Directors of the Gas Company. If he were to presume to give advice to those connected with gas companies, it would be that they should try to keep in touch with their local councils. Mr. Lake had always been associated with the interests of Ilfracombe, and both the town and the Company were fortunate in having him for Chairman. As to gas and electricity, in his opinion both could serve a useful purpose; and as competition was the heart of progress, he did not think the Gas Company, if they only kept themselves abreast of the times, need fear for the future.

Mr. W. C. RAFAREL proposed "The Visitors," and expressed the gratification of the Directors and their Engineer at seeing so numerous an assembly.

Mr. D. IRVING said that to those who knew Ilfracombe a very small pretext would serve at any time to bring them there; and they were very pleased to accept the Directors' invitation to be present, to visit the magnificent gas-works which had been put up, and to acknowledge the hospitality of their reception. An up-to-date gas undertaking was essential in any progressive town; and Ilfracombe might well feel proud of those who had brought the gas undertaking to the position in which they had seen it. He was pleased to notice that the Directors had had the wisdom and the courage to rise to the height of the occasion and of their responsibility, and had erected works which would not only well serve the town now, but offered facilities for large extensions in the future. He had a firm faith in the future of gas lighting. They must, however, not presume to think that they had any longer a monopoly. Only so long as they served the best interests of the consumers, and could produce light, heat, and power at a reasonable cost, did they deserve to prosper; and only so long would they prosper. He believed that this was fully understood by the Ilfracombe Gas Company. Their works did very great credit to the designers. They had in them elegance of structure, great substantiality, and convenience; and he should expect that gas would be produced in them most economically. His only regret, in coming there, was that they had not the pleasure of the company of their estimable Manager, Mr. Ball.

Mr. PRIESTMAN, proposing the toast of "The Manager and Staff of the Gas-Works," spoke of the excellent relations that existed between Mr. Ball and the Contractors during the erection of the works.

The CHAIRMAN, in Mr. Ball's absence, acknowledged the toast, and warmly eulogized Mr. Ball's devoted services.

The company shortly afterwards separated; but many of the visitors took advantage of the opportunity of the visit to Ilfracombe to spend a few days there.

NEW TYPES OF INVERTED BURNERS.

As mentioned in our Review of Proceedings at the Annual Congress of the Société Technique, two of the papers submitted dealt with the above subject. They were by M. Lecomte and M. Rieder respectively; and the principal portions of them are given in the following abstract translations.

M. Lecomte's Paper.

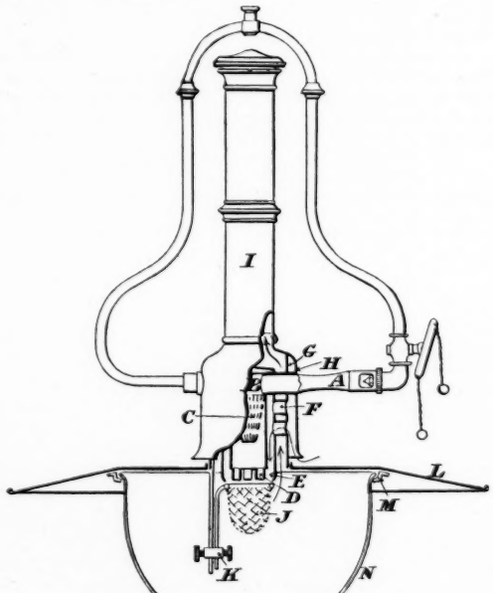
In this paper the author described the new high-power inverted burner introduced by the Société Française de Chaleur et Lumière. He began by pointing out that in 1888, M. Charles Angenot obtained photometric measurements of the Auer burner which gave a lighting power of 1·8 carcels for 70 litres (about 17 candles for 2·5 cubic feet) of gas. At the Paris Exhibition of 1889, the Auer mantle gave a light which was no better in intensity or efficiency than the regenerative burners then in use—giving one carcel (9·6 candles) for consumptions ranging from 40 to 50 litres, or 1·5 to 1·75 cubic feet. It was still more inferior to the Clamond burner—the pioneer burner constructed to produce incandescent lighting with the aid of refractory material—which brought down the consumption to 35 and even 25 litres per carcel-hour. In order to obtain incandescence with his magnesia-zirconia "basket," M. Clamond designed some ingenious and powerful combinations of burners, which were described at the congresses of the Society in 1899 and 1904; but none of them gave the results obtained by his latest design. Last year, in a note on incandescent lighting, a description was given of the high-power lamp of the Société Française de Chaleur et Lumière.* The experiments clearly showed that the efficiency increased in direct proportion to the volume of air drawn in by the bunsen burner; and this took place with such precision that analysis of the gaseous mixture made it possible to predict the photometric efficiency obtained by its combustion of that mixture. The new inverted burner does not utilize any of the principles at present known and applied in incandescent lighting. Yet it produces incandescence of a mantle of refractory earth of an intensity and a brilliancy not hitherto found in any measurements so far made; and its action appears to be on principles to which the theories of Dr. Bunte or Dr. Killing are not applicable. The former attributes the lighting power of an incandescent mantle composed mainly of cerium oxide to the small proportion of thorium contained in the fabric; the cerium playing the part, with respect to the thorium, of the carbon invariably present in the luminous flame of hydrocarbons. Dr. Killing attributes the luminosity of the mantle to the catalytic action of the cerium upon the carbon present in the flame; giving rise to an energetic combination in the mantle, and producing a temperature distinctly higher than that of the flame. Whatever may be thought of either theory, it is certain that in all the known apparatus for incandescent lighting, the maximum of light is obtained with the highest possible proportion of air, without, however, reaching the stage of complete combustion; the maximum of light being produced by a flame which, though slightly reduced, is still of such size that the mantle completely encloses it, and the combustion takes place within its meshes. In the inverted burner under notice, an entirely new principle has been adopted. Before describing it, M. Lecomte briefly reviewed the results hitherto obtained with familiar types of incandescent burners.

The earliest and most simple burner is that consisting only of a bunsen and a mantle; the former employing 4·5 volumes of air per unit volume of gas, and giving as much as 18 carcels with an efficiency of 15 to 16 litres per carcel-hour at pressures of between 2 to 3 inches. Though the most perfect burner of its kind, when worked at a high pressure, it is not suitable for many towns. Later types of burner are improvements on this form, supplementing a low efficiency of the bunsen by the admission of air round the mantle. The ordinary burner working at 12-10ths pressure gives one carcel-hour for a consumption of 15 litres (0·5 cubic foot) of gas, and even less. The bunsen supplies 3·5 volumes of air, and 3 volumes are admitted by the draught of the chimney. In the recuperative "Standard" gas-burner, 3·5 volumes of air come through the bunsen, and 3 volumes are strongly heated by passing between the outer glass chimney and the burner chimney. This arrangement increases the efficiency of the burner to about 12 litres (0·4 cubic foot) per carcel-hour. Certain special chimneys by Dr. Schott, of Jena, are applied so that the whole air supply is heated—a system worked out by Dr. Fischer, of Vienna, which reduces the gas consumption to 11 litres (0·35 cubic foot) of gas per carcel-hour. Both of these systems, however, were abandoned on the introduction of the chimney with air-holes in it. In a burner of this type, with the bunsen taking 3·5 volumes of air for 1 volume of gas, the remaining 3 volumes are admitted by holes pierced on a level with the head of the burner. The air on entering is projected against the surface of the mantle, and penetrates to the interior; and the active combustion which results makes possible an efficiency of 10 to 11 litres per carcel-hour at a pressure of from 8-10ths upwards. In a burner constructed according to the principle described by M. Servier in 1884, the action of the bunsen is the chief factor in the air supply—5·5 volumes of air being obtained to 1 volume of gas; and there are only one or two small holes at the base of the chimney to supply the remaining air. The lamp of this form requires 9 or 10 litres per carcel-hour. According to all these systems, the air is admitted in two separate currents—in the interior of the mantle by the gaseous mixture, and outside it to complete the combustion. The last type of inverted burner which may be referred to is that in which the products of combustion are separated from the inlet of primary air. Here the bunsen burner admits very little air—only 2·5 volumes for 1 volume of gas; but the efficiency is very good. being 13 to 14 litres per carcel-hour. There is, however, an access of air to the lower part of the mantle, as in the case of the perforated chimneys.

It is practically impossible to obtain a higher efficiency than the best of the above burners will give; but with the new lamp of M. Clamond, an improved result has been obtained. He sought to effect complete combustion of the gas at the highest possible temperature in the interior of the mantle without access of air to its outer surface; thus realizing once more, with considerable improvements, the system of inverted incandescent lighting which he originated a quarter-of-a-century ago. The new principle of combustion applied to the burner is thus described by him:

In all existing burners, a portion of the gas is consumed in the interior of the mantle by the air delivered by the bunsen, and the other part by the air obtaining access to the outside of the mantle. If, by a mechanical draught of air, a mixture is obtained containing a proportion of air sufficient for the complete combustion of the gas, the flame becomes very small, and is no longer capable of filling a mantle of adequate surface to radiate the heat of the flame; in other words, there is a disproportion between the thermic energy developed and the radiating surface of the mantle. If, however, combustion is effected with warm air, the size of the flame increases considerably, the consumption of gas remaining the same; and a mantle of the necessary size can then be filled. At the same time, there is in the flame an increase in the dissociated constituents, which only combine again in the meshes of the mantle, the radiant energy and luminous power of which are thus greatly augmented.

Consequently, the problem to be solved was to lead into the flame a mixture of air and gas as hot as possible. At the same time, a difficulty arose from the fact that it was not possible to raise the temperature of the air in a mixture of air and gas without risking premature ignition.



The following is a description of the new lamp, which is shown in the accompanying illustration: A is the bunsen burner, constructed on the Kern principle, and opening into a cylindrical mixing-chamber B, containing a diffuser C. The gaseous mixture burns in D, at the extremity of a number of apertures of appropriate shape. The mixing-chamber of the burner has around it a capsule E, in which, transmitted by the tubes F, circulate the products of combustion. The secondary air flows between the two chambers G and H; the arrows indicating the direction taken by the gases. A chimney I draws the combustible mixture across the meshes of the mantle, and serves for the escape of the burnt gases. The mantle J is fixed by the screw K so that it almost touches the capsule. The rest of the lamp consists of the shade L, beneath which is the glass globe N, supported at M, and hermetically enclosing the mantle.

There are many methods of lighting the lamp; the most practical consisting of a small hole in the globe, closed by a glass ball. This is displaced when the lighter is inserted, and falls back by its own weight when the lighter is removed. At first, the lamp gives only about half its lighting power; but as the heating of the

* See "JOURNAL" Vol. LXXXVI., p. 870.

regenerator goes on, the light increases, and is full on at the end of a few minutes. The new principle of combustion applied in this lamp permits of the use of mantles which are much stronger and heavier than those generally employed, and only half the size, and if used on an ordinary burner would give only a red glow almost devoid of illuminating power. The light is more intense in the upper than in the lower part of the mantle—a feature which likewise distinguishes the new lamp from others of the incandescent type. In ordinary burners, the reverse is the case. The new lamp is made in three sizes, consuming about 5, 10·5, and 21 cubic feet of gas per hour. One model examined consumed 35·3 cubic feet, and gave a light of 1300-candle power. The following are the results of some tests:—

Tests of a 300-Litre (10 Cubic Feet) Lamp.

		Angle to the Horizon. Degrees.		Intensity. Carcels. 1 C. = 9·6 Candles.
Standard . . . . . carcel = 119 litres		0	..	46·7
Calorific power . . . . . 4970 cal.		20	..	48·7
Hourly consumption of lamp . . 360 litres		40	..	49·8
Pressure . . . . . 60 mm.		60	..	45·9
		80	..	36·3
		90	..	35·3
Mean hemispherical intensity				46·6 = 447 candles

	Consumption per Carcel-Hour Under Experimental Conditions.		Gas brought to the 105 Litre Standard.
At an angle of 0 degrees	7·73	..	6·82
,, ,, ,, 40 ,, ...	7·22	..	6·36
Mean hemispherical intensity	7·74	..	6·83

Second Experiment at Low Pressure with Same Lamp.

		Angle to Horizon. Degrees.		Intensity. Carcels.
Hourly Consumption . . . . 341 litres		0	..	40·2
Pressure . . . . . 33 mm.		20	..	41·8
		40	..	42·7
		60	..	38·8
		80	..	35·7
		90	..	34·6
Mean hemispherical intensity				40·0 = 384 candles

	Consumption per Carcel-Hour Under Experimental Conditions.		Gas brought to the 105 Litre Standard.
At an angle of 0 degrees	8·50	..	7·49
,, ,, ,, 40 ,, ...	8·00	..	7·06
Mean hemispherical intensity	8·52	..	7·51

Test of a 600-Litre (21 Cubic Feet) Lamp.

[Standard of gas, 121 litres.]

	Consumption Pressure.		Intensity. Carcels.	Consumption per Carcel-Hour Under Experimental Conditions.		Gas brought to the 105 Litre Standard.
Horizontal intensity .	600 litres	60 mm.	83·0	7·95	..	6·90
	730 ,,	30 ,,	90·2	8·08	..	7·02

It will be seen from these tests that the new lamp gives the unit of light for a consumption of less than 7 litres of gas, and a luminosity of 400 to more than 900 candle power per mantle. This is an achievement which, in the author's opinion, is absolutely unique in the gas industry. The consumption of 10 litres of gas per carcel-hour has been the very highest efficiency hitherto obtainable for incandescent burners. With this lamp an improvement to the extent of 30 per cent. has been obtained by the adoption of a new principle which is capable of important applications. The new lamp could, no doubt, be employed for many purposes of high-power lighting, being many times more economical than electricity, and adapted to the design of decorative fittings. Finally, it has the great advantage of working at a low pressure.

M. Rieder's Paper.

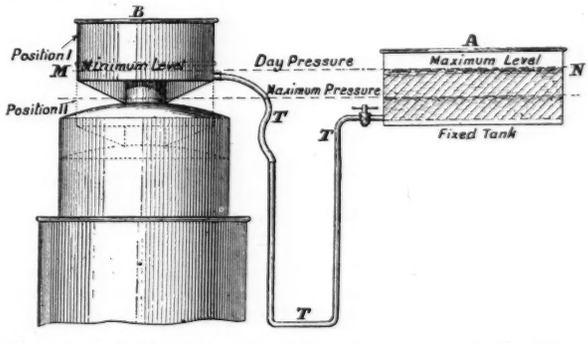
In his paper, M. Rieder criticized the existing types of inverted burners, the defects of which were alleged to be so great as to prevent the general adoption of this system of lighting. All the appliances hitherto devised were, he said, based on the use of a bunsen burner placed in an inverted position; the gas entering above and passing downwards. By this arrangement the air-draught was very imperfect, since, the gas being compelled to descend, it was necessary to shorten the chamber of the bunsen, and therefore the mixture had not time to be properly formed. It was consequently necessary to increase the gas supply, from which resulted incomplete combustion. Finally, the position of the mantle was a somewhat delicate one, and led to numerous breakages.

The author then proceeded to describe the burner bearing his name, which he said was designed on the opposite principle. It is fitted with a normal bunsen burner; the gas entering from below and passing upwards. The tube is curved, and the burner is inverted only after the perfect mixture of the gas prepared in this tube. On the principle that the efficiency of a burner depends on the perfection of the gaseous mixture, the inventor has been at pains to introduce in the best form the two factors of first importance—viz., the employment for the air-draught of the total pressure available, and the adjustment of the gas supply. The burner is constructed so that there is no obstacle to the pressure, and is provided with a sensitive adjustment devised so that the consumption of gas can be instantaneously increased or reduced, delivering, almost to the tenth part of a litre, the quantity of gas required to obtain the maximum incandescence. Owing to its construction, and to the passage of a cool gaseous mixture, there is no over-heating of the burner. The following results have exceeded the inventor's anticipations: His No. 2 burner, at 28-10ths pressure, gives a carcel (9·6 candles) with a consumption of 10·08 litres of gas. The No. 2 Auer burner gives a carcel with 16 to 17 litres. The small No. 1 Reider burner gives 30 candles with 30 litres of gas, which quantity may perhaps be reduced to 20 or 25 litres by using a slightly smaller mantle. The burners work at a low pressure. At 6-10ths, the No. 2 gives one carcel with 20 litres, and at 10-10ths the same quantity of light with 15·5 litres. The burner has been made in several sizes, and others are being prepared.

THE AUTOMATIC REGULATION OF GAS PRESSURE IN TOWNS.

Among the papers read at the recent Congress of the Société Technique du Gaz en France was one in which M. Frère described an apparatus devised by him for the automatic regulation of the pressure of gas in towns.

The plant consists of two vessels A B, the former being fixed, and the latter placed on the bell of the governor, and consequently moving with it. These two vessels, containing a definite quantity of water, are connected by a flexible tube T. The regulator being in action, let us suppose that with the bell in Position I the level of water in the two vessels will be at the horizontal line M N. If the consumption of gas increases, the bell falls, carrying with it the vessel B. Hence a certain weight of water flows from A into B, and the latter drops into Position II. If, on the other hand, the consumption falls, the contrary takes place; the regulator emptying itself automatically. Hence by making



the two vessels of appropriate sections, the pressure in the town can be adjusted to any extent desired. Using the ordinary governor, the outlet pressure could be so adjusted that the pressure at the central point of a district should be sufficient for the regular supply of the distributing system extending from it. A pressure register at this point and another at the governor outlets are used as checks. The distance through which the bell sinks when passing from the ordinary day pressure to the maximum pressure was carefully measured, and found to be 105 mm. The excess loads corresponding to the two positions were respectively:

$P_1 = 11{\cdot}300$ kilos (day). $P_2 = 24{\cdot}400$ kilos (maximum).

The difference, $P = P_2 - P_1 = 13{\cdot}100$ kilos, represents the excess necessary to change the day pressure into the night pressure. The problem can therefore be stated as follows: Determine the section S_1 of the vessel A and S_2 of the vessel B so that when B falls through 105 mm. (H) the weight of liquid passing from A to B shall be 13·100 kilos. Calling h_1 the distance through which the water falls in A, h_2 will be that which it rises in B; and the sum of these distances is equal to H.

(1) $h_1 + h_2 = H = 105$ mm.

The weight of water passing from A to B is equal to P—

(2) $S_1 \times h_1 = P = 13{\cdot}100$ kilos.
(3) $S_2 \times h_2 = P = 13{\cdot}100$ kilos.

All the conditions of the problem having been stated, M. Frère pointed out that they furnished only three equations to determine four unknown quantities; and that consequently there must be an infinite number of solutions. But he said it was possible to fix arbitrarily a fourth relation compatible with the preceding.

In manipulating the apparatus, the moveable vessel, made of galvanized iron, and weighing 3·7 kilos., should be loaded during the day with a quantity equal to 7·6 kilos., corresponding to a height of water of 35 mm. in the vessel. In the fixed vessel there is placed above the outlet a quantity of water greater than P = 13·6 kilos., and less than that with which the governor should be loaded in order that the pressure should be equal to that of the gasholders, inasmuch as in this case the governor loaded full would not be able to rise again. This loading being in the above case 16 kilos., M. Frère took the weight of water at 15 kilos.

To adjust the relative positions of the two vessels, it is necessary to proceed as follows: Place B, loaded as above, on a level with the bell of the governor. When equilibrium has been obtained, place A so that the level of water in the two vessels shall be the same; then connect the vessels by means of the rubber tube. The action of the apparatus being based on identical positions of the governor for identical consumptions, it follows that it is absolutely essential that the pressure at the inlet of the governor controlling the town supply should be constant. Therefore, in the case of telescopic gasholders, it is necessary to have a primary pressure regulator between the gasholders and the governor-house.

In the example selected above, the excess load was proportional to the range of movement of the bell. Under these conditions, the two vessels should have throughout their height a constant section, wherefore it is sufficient to determine the weights and the extreme heights. It would not be the same if this proportion did not exist. In this case it would be correct to choose a certain number of intermediate points, and to calculate the corresponding sections. By supposing that the fixed vessel has a constant section, there will be a movable vessel of appropriate shape, widened out or constricted according to varying circumstances.

With regard to the results obtained, a number of pairs of curves showing them graphically were appended to the paper. In one curve of a pair the succession of pressures at the outlet was shown; in the other, that of the corresponding pressures at the central point. The results shown in the first diagram were obtained on a week day in December, 1904; those in the second, on a Sunday of the same month; those in the two others, on a week day and a Sunday in May, 1905. The curves showed the alterations in pressure as the result of varying consumption, and the first also demonstrated the effects of irregularity in the pressure at the inlet of the governors, which acted so inefficiently as to cause a difference of pressure of 25 mm. (10-10ths).

In submitting his regulator to his colleagues, M. Frère said he did not claim that its action was absolutely mathematical. At the same time the results it gave were satisfactory in practice, and much more exact than those which could be obtained by hand regulation. Moreover, the system possessed the advantage of putting on the extra pressure at the precise time when the consumption of gas was increasing, and of taking it off gradually as the demand slackened.

CEMENT JOINTS FOR GAS-MAINS.

At the Annual Meeting of the Western (U.S.A.) Gas Association, a paper on the above subject was read by Mr. JACOB D. VON MAUR, of St. Louis. The following is a full abstract of the communication.

The author began by stating that during the past year the Laclede Gas Company received notice from the Director of Public Works of the city of St. Louis to discontinue the use of cement joints when laying gas-mains throughout the city, on the ground that these joints would undoubtedly leak in the future, and so would necessitate opening the streets in order to effect the necessary repairs. As there had never been any objection on the part of the city to the use of lead, it was assumed that the officials felt that there was a greater chance of leakage where the joints were made with cement. In order to convince them that by using cement for making joints, the leakage would be lessened rather than increased, and that there would therefore be less opening of the streets, it was decided to make a thorough investigation of the whole subject. For this purpose, information was requested from a large number of gas companies throughout the United States, in order to determine what the experience was in other cities. A circular letter was accordingly written to all the leading gas companies; care being taken to select companies whose answers, when compiled and tabulated, would represent the average judgment of the gas engineers throughout the country. The following were the questions put :—

1.—To what extent are you using cement in the laying of gas-mains in your city?
2.—How many years have you been using cement?
3.—Have leaks in gas-mains increased or decreased since you started to use cement instead of lead for the joints?
4.—Have any really serious leaks occurred on a cement joint when the work was properly done?
5.—Is there any objection on the part of the city authorities to the use of cement for this purpose?
6.—Do you make any provision for expansion?
7.—Assuming that pipes are laid with the minimum cover of 4 feet, and the joints are properly made with cement, do you think the chances of a leak would be increased or decreased over what they would be had the joints been made with lead?
8.—What brand of cement do you use?

In all, 60 letters were sent out; and evidence of the appreciation of the importance of the question is furnished by the fact that 52 answers were received, accompanied, in a large number of cases, by a request for a copy of the report when the investigations were completed. The President of the Laclede Company (Mr. O. O. Thwing) requested the author to furnish the information to his professional colleagues in the form of a paper; and this he consented to do. Appended thereto is a summary of the answers, which brings out the following points: (1) The answers which are unfavourable to the use of cement come from cities where it has never been tried very extensively. (2) There seems to be some prejudice against the use of cement in the business sections of the very large cities. (3) In a number of cases the cement joint was used to a very limited extent with very good success, yet for some unexplainable reason its use was not continued. (4) In every case, with one exception, portland cement was used; and in the exception noted, Rosendale cement was employed. (5) There is a difference of opinion as to whether it is necessary to use the foreign or more expensive brands of portland or domestic cements. (6) There is a very wide difference of opinion as to whether or not provision should be made for expansion; but in every case where provision was made at all, it was done by inserting lead joints at stated intervals. (7) It seems to be the generally accepted opinion that cement should not be used in soft places, or in any spot where there is likely to be any settlement of the pipe, or where the pipe is subjected to vibration. (8) It is very important to note that in almost every case the tests applied to pipes laid with cement joints are many times greater than the tests applied to pipes laid with lead joints. (9) In only one case was an objection made by the city officials to the use of cement joints, and this objection was removed as soon as the value of the joint was demonstrated; so that at present there is no record of an objection on the part of the city officials to the use of cement in making-up joints. (10) In no case has the leakage increased, and in nearly every case it has decreased, by the use of cement.

Before proceeding to consider the preceding points, the author gave an account of what had been done in St. Louis. The Company commenced laying mains with cement in May last year; and in twelve months all the mains had been dealt with. Starting with the 4-inch size (the smallest), he presented to the meeting full reports of the work done. The first test was to determine the pressure at which a 4-inch cement joint properly made would leak, and to ascertain whether such joints would leak when they were subjected to a settlement of the pipe. Four lengths were taken, with five joints; and the material was mixed in the proportions of 2 quarts of cement to $1\frac{1}{3}$ pints of water. The joints were allowed to set for 36 hours, and then a trial pressure of 60 lbs. was put on, which was gradually increased until the limit of the engine —viz., 125 lbs. per square inch—was reached. This pressure was allowed to remain for 30 minutes, without any apparent variation in the gauge. The joints were also tested with soapsuds every five minutes, to see if any leaks could be detected. In order to ascertain if a cement joint had any elasticity, a man was placed in the middle of the line, and after the centre blocking was removed he danced up and down on it, causing it to fluctuate from 6 to 8 inches each way. Even at this high pressure and undue strain, no leaks were found, nor was the cement disturbed in any way. The blocking was then taken away from the ends, and the plug and the cap left free of support, in order to see if the high pressure would move them out of place. No motion was observed. The pressure was then reduced to 15 lbs. per square inch. In order to ascertain the amount of give or play a cement joint would allow, the line was subjected to the following severe test: The two ends were gradually elevated until they were 25 inches above the ground level; then the centre blocking was removed, and the pipe allowed to sag in the middle. It was found that the sag amounted to 12 inches. In order to find the point of fracture in the facing of the joints, the pipe was gradually weighted down until, at a sag of 15 inches, a slight leak was discovered in the bottom, where the cement began to lose amalgamation with the iron. Additional weights were placed on it until the pipe reached the ground; the sag amounting to $24\frac{5}{8}$ inches. The facing then cracked in several places. The process was then reversed—the two ends being left free, and the block being placed in the middle. It was found that when the curve was reversed the leak in the bottom stopped, and for a time the joint was tight again. This reversed process was continued until the centre was at a height of 28 inches from the ground. The free ends were then swinging in the air, and, in order to keep them on the ground, weights were placed on them. Only one joint was in any visible way disturbed during the whole test, and that was the centre one. As a final touch, the whole four lengths were again blocked up to a height of 24 inches, and then pushed off and allowed to drop the entire distance to the ground. But even after this shock, no fractures were apparent in the joints.

The second test was made in order to ascertain whether cement joints could withstand a pressure of 50 lbs. Three lengths of 6-inch pipe were taken—four joints in all—and 2 quarts of "Star"

cement were used for each, mixed with 1½ pints of water in the first and second joints, 1⅝ pints in the third, and 1⅔ pints in the fourth, with the addition of a quarter-of-a-gill of muriate of ammonia. The last solution was made as an experiment, to see what the effect of the ammonia salt would be on the joint, and its action upon the cement. These four joints were thoroughly caulked and rammed, and after being allowed to set for 40 hours were subjected to a pressure of 24 lbs. This was gradually increased until the gauge stood at 100 lbs., which pressure was maintained for half-an-hour. The joints were thoroughly inspected and tested while the pressure was being applied; and even at this high figure no perceptible leak was discovered, nor was a variation of the gauge visible.

The third test was also made on a 6-inch main, 165 feet in length. A pressure of 10 lbs. was put on, and each joint was examined carefully. After this, 5 lbs. at a time, until a pressure of 50 lbs. was reached, which was all the pump would give; and still no leak was detected. There were 5 oz. of yarn used to a joint, 9 or 10 strands to the first yarn, which was driven back solid. The joint was then filled, and a second yarn of 11 or 12 strands put in and driven hard. The joint was then faced with a thin layer of "Red Ring" cement, mixed in the proportions of 3 pints of cement to 1 pint of water. The cement was allowed to set for 72 hours before it was tested.

The fourth test was made on a 6-inch pipe with lead joint, in order to determine at what pressure the lead would give way. The following are the results: At 13,900 lbs. pressure the lead moved; at 24,740 lbs. pressure the iron broke. With a cement joint, at 29,450 lbs. the cement cracked outside; at 32,000 lbs. the iron broke. Holes were drilled into the 6-inch pipe to facilitate making the test of the joints, so that the tension at which the pipes broke does not represent the total tensile strength of the iron. The test is given simply to show the relative strength of lead and cement joints.

The next four tests may be conveniently noticed together. One was made on 1000 feet of 10-inch main laid with cement joints in soil saturated with water. The pipe was tested to 50 lbs. pressure without showing any leak. Another test was made on a new high-pressure 12-inch pipe-line. The section tested consisted of 19 lengths of standard 12-inch pipes jointed with cement. On Sept. 16, 1904, 24 hours after the last joint was made, a test pressure of 10 lbs. to the square inch was put on the line, with the result that all the cement joints, with the exception of two, were found to be sound. The two which leaked were made by a new man, which probably accounted for their not holding so well as they should have done. The next test was made on a 16-inch pipe with a pressure of 4½ lbs. per square inch. Altogether, 93 cement and 18 lead joints were tried. The pressure was on for one hour, during which time it lost only 1-10th of an inch. This was due to leaks in the plugs at either end of the line, the joints of which were made of plaster of Paris. A test was made on a section of the new 20-inch main. There were 36 lengths of pipe, with 16 lead and 21 cement joints. The test lasted 1½ hours, and not a joint leaked under a pressure of 12 lbs. per square inch.

The author then gave some particulars of the ninth test, made on a 24-inch high-pressure main, the joints of which had been formed with "Star" cement. The report on this test described the operations. The spigot and socket of each pipe were thoroughly washed and cleaned of all foreign material, and then placed home. A grouted yarn of six strands was thoroughly caulked in, after which cement was placed of the following proportions: Cement, 5 quarts; water, 1½ quarts, *plus* 1 gill. This amount of cement was sufficient to finish the entire joint, including filling and facing. After the cement, batter was placed in the joint by hand, a caulking-tool of the third size was used, and the cement then thoroughly rammed. A second yarn of seven strands was next put in dry, and driven back with the same tool and a hammer. The joint was then faced. The whole job, consisting of 15 joints, including the cap and plug, after setting 27 hours, was subjected to a test of 10 lbs. of air, and the joints were all examined and tested with soapsuds. As everything was found to be in perfect condition, the pressure was gradually raised to 25 lbs., and maintained at this figure for an hour without any visible sign of a leak or variation in the gauge reading. After this test was made, it was found necessary to use 8 quarts of cement to 4½ pints of water. This additional amount was due to larger joints and hard driving of the cement. On one of the tests a few joints were seen to "sweat" at 15 lbs. In order to see if "patching" would be feasible in this case, a trial was made, but it was a perfect failure.

The next two tests were also on 24-inch high-pressure mains. In the first there were 56 joints, and the cement used was of three different grades. With one exception, the standard proportions of cement and water were employed. The joints were allowed to set for 40 hours, and then a test of 15 lbs. was applied, without the discovery of a single leak or sweat. In the second test, there were 60 joints, made with cement mixed in the following proportions: Cement, 8½ quarts; water, 2 quarts and 3½ gills. After these joints had been allowed to set for 36 hours, a test of 20 lbs. per square inch was applied, and the line was found tight in every respect.

The twelfth experiment was made with 31 lengths of 30-inch pipe, tested to a pressure of 30 lbs.; the gauge being allowed to stand for two hours without showing any drop. The joints were also tested with soapsuds, and no leaks were found. A test was made of 88 cement and 20 lead joints on a 16-inch main, with a pressure of 10 lbs., which was left on for 1 h. 40 min., during which time each joint was tested with soap and water. At the end, the gauge still registered the full 10 lbs. The following day, after the main had been connected to one which was being laid, a pressure of 5 lbs. was put on both lines and left for an hour. The gauge did not vary in the slightest degree. The thirteenth test was on a 24-inch main with 11 lead and 14 cement joints. A period of 40 hours was allowed to elapse after the last joint was made before the test, and this lasted three hours. Two kinds of cement were used in equal parts, mixed with warm water; and the joints were made at from 21° to 24° Fahr. Other tests were made on 12-inch mains having 88 and 64 joints respectively; and the results were satisfactory.

A test of 4-inch cement joints, which had been made when the thermometer registered 31° Fahr., was made to see what effect freezing weather would have upon the cement. Ten lengths of pipe were laid for the test, and the joints were made with "Star" cement. In every case the water used in mixing the cement had been slightly warmed. Immediately after the completion of each joint, it was wrapped with a sack and covered with a layer of earth about 8 inches deep. After a 40-hour set (from Saturday afternoon until Monday morning), an air pressure of 10 lbs. was put on the joints, which were tested with soapsuds for leaks. The pressure was then raised to 20 lbs., and the joints again tested with soapsuds. In neither case was there a leak found. The pressure was further raised—this time to 30 lbs. When this had been on an hour, a final test was made with soapsuds, and again no leaks were found. The results of this test would warrant the statement that cement joints are not affected by moderately cold weather.

Having disposed of the reports of the various tests, the author proceeded to refer to the ten items already given. He said that, in view of the favourable results obtained in 29 cities out of the 52 from which replies had been received (23 not using cement), and of the experience in St. Louis, the great economy to be effected by using cement joints was not fully appreciated. He gave the following table showing the saving in money per mile of main laid for each size; the figures in the second column being based on the standard dimensions of pipe and the minimum amount of lead used.

Size.	Saving per Mile of Main.	
4 inches	$170	$114·80
6 ,,	218	129·80
8 ,,	319	165·00
10 ,,	398	244·20
12 ,,	490	337·92
16 ,,	660	554·40
20 ,,	834	822·80
24 ,,	1249	1137·08
30 ,,	1632	1485·00

The author went on to point out that one great advantage of the cement joint is its capability of resisting electric currents better than a lead joint; and he quoted in support of this Mr. E. E. Brownell, who, in his "Electrolytic Survey of the City of St. Louis," cites an example of a 6-inch main, 100 feet long, which being tested showed a resistance of 12,000 ohms. In order to get some idea as to the relative resistance of the various kinds of joints, an experiment was made in St. Louis by making up four short pieces of 4-inch cast-iron pipe. The first two joints were made with an asbestos gasket in the back of the socket, to prevent the spigot from touching it. The joints were made with cement in the usual manner. The third joint was an ordinary cement joint without the asbestos gasket; while the fourth was made of lead. The following is a report of the test: Joint No. 1 showed a resistance of 18·2 ohms; No. 2, of 19·18 ohms; No. 3, of 17·64 ohms; and No. 4, of 0·000385 ohm. This test proves that a cement joint has a great advantage over a lead joint from an electrolytic standpoint. The third advantage is the fact that the work can be done with unskilled labour; while the fourth is that a cement joint is less liable to leakage than a lead one. The latter the author considered the greatest advantage of all.

Coming to the second item, the author said there seemed to be a prejudice against the use of cement in the business sections of very large cities. He was unable to account for this, because his experience with lead joints, both in St. Louis and elsewhere, had been that the largest number of broken mains had occurred in that part of the city, and were laid with lead joints. Last year they had more than 100 broken gas-mains, upwards of 75 per cent. of which were in the business section; and in every case the joints were made with lead. They had no records showing any broken mains where the joints were made with cement, although there were in St. Louis many miles of such mains which had been laid for a great number of years. Last year they laid 60 miles of pipe with cement joints and 35 miles with lead joints; but they had only one slight leak on the entire length of pipe. The author claimed that if a main were properly laid with 4 feet of cover, and so as to have an even bearing, as shown in fig. 1 in the diagram on the next page, and not as shown in fig. 2, there would be less likelihood of a leak or a break with cement than if lead were used; and it was his intention during the coming season to use cement joints in the business section of St. Louis, as well as in the suburban part of the city.

Regarding the kind of cement to be employed, the author's experience, as well as that of other cities, shows it is immaterial

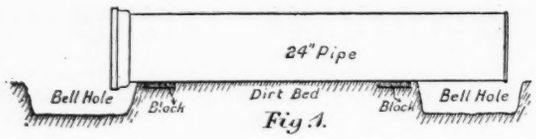


Fig. 1.

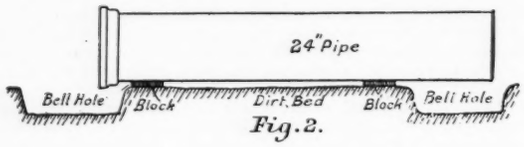


Fig. 2.

what brand is used. Any good American portland cement would give good results; and as it was cheaper than foreign brands, there was no good reason for using the latter.

Dealing next with the provision to be made for expansion, the author said he thoroughly agreed with Mr. Forstall that it was unnecessary to provide for it. A survey of the answers received showed that lead joints were inserted every fourth or fifth joint in some cities, and one lead joint to the block in others. Surely if one lead joint to the block was sufficient, then one in every fifth or sixth was more than sufficient. He thought it would be interesting if some of the members explained why they inserted the number of joints they used, as they must have somereason for doing so. Last winter, the frost in St. Louis reached a depth of 3 feet to 3 ft. 6 in. His experience, of course, was all based on 4 feet of cover; and possibly if the pipes were laid with less, it would be necessary to make some provision for expansion. Two years ago they laid some 10 miles of 3-inch wrought-iron pipe in cement and pitch, and made no such provision. This pipe was under a constant pressure of 250 lbs. per square inch, and yet had never shown leaks at the joints.

Passing on to the remaining items, the author said it seemed to be the generally accepted opinion that cement should not be laid in soft places; the idea being that the pipe might settle, and that on account of the rigidity of a cement joint leaks would develop more readily than with lead joints. In the face of the first experiment, it would seem, he said, that there was a great deal more elasticity in a pipe-line laid with cement joints than had been generally supposed. He should not hesitate to use cement under any conditions where he would be willing to lay a gas-pipe. If the ground were so soft as to make it dangerous to employ cement joints, he should certainly make provision to get a good foundation before laying pipes, no matter what kind of joint was used.

With regard to the high pressure under which cement joints were usually tested, he believed that this was done more as a precaution than from any real need. According to the nature of cement, it was necessary, in order to develop its full strength, for it to set at least seven days. Since this was impracticable in pipe laying, tests were usually made within 24 hours. He would therefore be in favour of applying a test of a few pounds on ordinary low-pressure work, rather than put on a test of from 30 to 50 lbs., which seemed to him to be a useless expenditure of money after it had once been determined that a cement joint properly made would remain tight.

The appendix to the paper consisted, as already mentioned, of the replies received from those to whom the circular-letters were sent. The following is a summary of the answers to the eight questions:—

1.—Entirely, 10; almost entirely, 19; for repairs to mains only, 2; in works only, 1; do not use cement, 20.

2.—One year, 2; three years, 1; five years, 3; six years, 3 seven years, 1; eight years, 2; ten years, 3; fifteen years, 3; twenty years, 2; twenty-five years, 1; thirty years, 1; forty years, 1; forty-seven years, 1; fifty years, 1; fifty-five years, 1; have always used cement, 3 did not answer, 3; do not use cement, 20.

3.—Decreased, 19; experience not long enough to answer, 3 have always used cement, 6; no change, 2; used for repairing on leaks only, 1; do not use cement, 19; never used lead, 1; did not answer, 1.

4.—No, 29; seldom, 1; did not answer, 2; do not use cement, 20.

5.—No, 35; did not answer, 1; do not use cement, 16.

6.—No, 17; yes, 12; did not answer, 6; do not use cement, 16.

7.—Decreased, 29; did not answer, 5; do not use cement, 18.

8.—Dyckerhoff, portland, 6; Bonneville, portland, 1; Manheimer, portland, 2; any kind of portland, 8; Atlas, 2; Alpha, 1; Alsen, 3; Orchard brand Roman, 2; Star, 1; Hoffman brand, Rosendale, 1; American hydraulic, 1; did not answer, 9; do not use cement, 15.

A number of tables were attached to the paper, which, with the detailed information contained in the various experiments, might, the author thought, prove useful to anyone contemplating the use of cement joints who had hitherto employed lead. The following table shows the approximate quantities of material used at St. Louis for cement and lead joints:—

Size of Pipe. Ins.	Cement Joints.				Lead Joints.	
	Cement in Quarts.	Cement in Pounds.	Water in Pints.	Yarn in Ounces.	Lead in Pounds.	Yarn in Ounces.
4	1 to 1½	2·25 to 4·10	¾ to 1½	4	7½	2½
6	1½ ,, 2	4·10 ,, 5·50	1½ ,, 1⅞	6	10	3½
8	2 ,, 2½	5·50 ,, 6·87	1½ ,, 1½	8	15	5
10	2½ ,, 3	6·87 ,, 8·25	1½ ,, 2	10	19	7
12	3 ,, 4	8·25 ,, 11	2 ,, 2½	12	23	9
16	4 ,, 5	11·00 ,, 13¾	2½ ,, 2½	15	30*	9
20	5 ,, 6	13·75 ,, 16·50	2½ ,, 3½	20	37½	10
24	8 ,, 8½	20·00 ,, 23·38	5 ,, 5½	27	60*	16
30	7 ,, 7½	19·25 ,, 20·62	4 ,, 4½	27	72	17

* The lead space in the 16-inch sockets was very small, and in the 24-inch sockets very large.

The following table shows the cost (in dollars) of cement and lead joints, and the saving per joint in cement over lead:—

Size of Joint.	Cement Joints.				Lead Joints.				Saving per Joint in Cement over Lead.
Ins.	Cement.	Yarn.	Labour.	Total.	Lead.	Yarn.	Labour.	Total.	
4	0·02	0·012	0·040	0·072	0·375	0·008	0·075	0·458	0·386
6	0·03	0·020	0·065	0·115	0·500	0·010	0·100	0·610	0·495
8	0·04	0·025	0·100	0·165	0·750	0·015	0·125	0·890	0·725
10	0·05	0·030	0·135	0·215	0·950	0·020	0·150	1·120	0·905
12	0·06	0·037	0·170	0·267	1·150	0·030	0·200	1·380	1·113
16	0·08	0·050	0·200	0·330	1·500	0·030	0·300	1·830	1·500
20	0·10	0·057	0·300	0·457	1·875	0·037	0·400	2·355	1·895
24	0·13	0·068	0·440	0·638	3·000	0·044	0·660	3·704	3·066
30	0·14	0·085	0·550	0·775	3·600	0·055	0·830	4·485	3·710

EXTENSIONS AT THE WALLASEY WATER-WORKS.

By J. H. Crowther, Engineer and Manager of the Wallasey Gas and Water Works.

[The Second Paper Read at the Annual Meeting of the British Association of Water-Works Engineers.]

In 1901, the annual meeting of this Association was held at Birkenhead, and a visit of inspection was made to the water-works of the Wallasey District Council. Mention was made at that time of some extensions in progress and of other works which the Council contemplated proceeding with in the immediate future; and it is of these extensions, which have recently been carried out from his designs and under his superintendence, that the author proposes to give a few particulars.

Dealing first with the extensions which were in progress in 1901, it is to be observed that the engines and pumps at the Liscard (No. 2) Station were constructed upon the lines then indicated; but in consequence of the quantity of sand drawn into the boring with the water, several alterations had to be made to the lift pumps. The barrels, buckets, and valves were originally of cast iron with a guttapercha packing to the buckets; but so rapidly did the valves and seats score that, after only six weeks' work, the quantity of water raised was but two-thirds of that lifted at the commencement of the run, as recorded by a "Venturi" meter. Trouble was also experienced from the heating of the guttapercha rings, due to the excessive amount of friction. The valves and seats were faced three times, but with the same result. It was then decided to put in a gunmetal-lined barrel, and gunmetal facings to the valves and seats, and to provide a deeper and water-packed bucket. The author is pleased to say that the adoption of this course was followed by satisfactory results. Another difficulty experienced was with the seating of the foot-valve, which was originally metal and metal. Even with a dead weight of two tons, the valve could not be kept tight; but by adding rubber to one face, the trouble was overcome, and the valve still left free to be lifted from above without any disturbance of the pump-trees or rising-tubes. Since these alterations the plant has done satisfactory work, and has lifted up to 2¼ million gallons per 24 hours, with a loss of head or lowering of water-level in the borehole of 30 feet as measured by an air-compressor.

The steam and water pipes between this plant and the boilers (which are situated on the opposite side of the yard—at No. 1 Station) are carried on overhead lattice girders. The boilers work at a pressure of 80 lbs. per square inch, and are fitted with Meldrum's patent furnaces, burning gas-works coke, at the cost of 8s. 11d. per ton delivered. The cost of pumping from a depth of 300 feet against a head of 140 feet works out at 0·334d. per 1000 gallons for fuel alone. The total cost of the works, including the foundations and alterations, was £16,500.

For the duplication of this plant, alterations on amore or less extensive scale were commenced at No. 1 Station on the opposite side of the road, where new borings were sunk from the bottom of the existing well, and the pumps lowered to a depth of 275 feet from the surface, or 112 feet deeper than originally fixed. By this

means the daily yield was augmented by nearly 1,200,000 gallons, or from 1,100,000 to 2,250,000 gallons; the pumping levels being 10 ft. 6 in. and 30 feet respectively below standing-level. A special condition in connection with the alterations and extensions at this station was that one set of pumps was to be ready at any time for duty, if required, without stopping the contract work. Upon three occasions, the author found it necessary during the progress of the work to bring into use one set of pumps for augmenting the supply to the district, and no complaints resulted therefrom. A line of tubes was carried from the bottom of the well to the engine-room floor; and through these tubes the boring tools and sand pump passed, with the result that there was no disturbance or discoloration of the water in the well. The cost of these works—including boring, tubes, alterations and additions to and lowering the pumps—was £4200.

The works which in 1901 the Wallasey Council contemplated carrying out—viz., a covered reservoir and a water-tower at Gorsehill, New Brighton—have been completed.* The reservoir is L-shaped, has a total length of 312 ft. 6 in., with a width of 92 ft. 2 in. for 169 ft. 9 in. of the length, and a width of 139 ft. 5 in. for the remaining 142 ft. 9 in. of its length. The depth is 20 ft. 6 in. to the overflow; and it has a capacity of 4,360,000 gallons. It adjoins another reservoir of 2,000,000 gallons capacity designed by Mr. H. Ashton Hill (when Engineer to the Council), and constructed in 1886; the two being connected by a 24-inch main.

The excavation for the new reservoir was in sandstone of a very variable quality, interspersed with beds of clay and sand. From the bottom of the excavation, a wall of 9-inch brickwork in cement was built up at a distance of 2 inches from the rock face; the cavity after every rise of 2 feet of height being run in with 3 to 1 Portland cement grouting—the soft places in the rock having been previously cut out and made good with brickwork in cement. The retaining-walls above ground were formed of 6 to 1 concrete, faced with rock from the excavation, and finished with a stringer and blocking course. The floor, 12 inches thick, was formed first of 6 inches in depth of 4 to 1 concrete; extra depth being given for the pillar foundations. This floor and the walls were then covered with bitumen sheeting, after which another layer of concrete, 5 inches thick and of the same quality, was laid on the bottom sheeting, and finished with 2 to 1 sand and cement rendering 1 inch thick. The vertical walls were faced with 4½ inches of second quality glazed bricks, which were allowed to be substituted for engineering bricks.

The pillars are of engineering bricks—four bricks by four for a height of 10 ft. 6 in., and three-and-a-half by four bricks for a further height of 8 ft. 6 in., finished with a stone cap 18 inches deep and the full width of the pillar. The whole of the brickwork was set in 3 to 1 cement mortar. The plate girders, resting on the pillars, are 25 feet long by 2 feet deep, bolted up longitudinally, and tied transversely by means of 1⅛-inch bars. Red pressed springer blocks are fitted to the bottom plate of the girders, and run in solid behind with cement grouting, while similar blocks are also set on the retaining walls. The arches, 15 feet span and 3 feet rise, are formed of three rings of local brick set in 4 to 1 cement mortar; the haunches being filled in with 10 to 1 concrete, and the crown formed of 5 to 1 concrete worked up to a fair surface with the necessary falls to aid drainage. Ventilators are provided to each arch. Entrance is gained to the reservoir by means of a staircase 3 feet wide, formed of brick in cement with York stone treads, from a covered gangway connecting the reservoir with the tower.

The tower and turret are of stone from the Runcorn Quarries, and octagonal on plan, with foundations and footings of 6 to 1 cement concrete laid on rock. The base of the tower is of closely pick-faced and coursed ashlar work, battered for a height of 16 feet from the footings to the window-sill course, after which it is carried up perpendicularly to a further height of 56 feet. The arches around the tank are supported by 32 circular columns, with moulded bases and carved capitals. The cast-iron tank is placed at a height of 49 feet above the floor-level, and immediately above the main cornice; and above this a flat roof is formed of concrete and expanded metal, finished with a surface of asphaltic rock. Access to this floor is gained by means of a spiral staircase in the turret. The tank is 34 feet diameter by 12 ft. 6 in. deep, and is screened from view by the balcony, which admits of the tank being inspected and painted. There are in the tower three vertical pipes leading to and from the tank, each fitted with expansion joints. The pumping-main is 18 inches diameter; the supply main from the Vyrnwy aqueduct 21 inches; and the overflow to the reservoir 24 inches. A 9-inch pipe, with non-return valve, is also connected to the bottom of the tank and into the 18-inch pipe. Water may be delivered directly into the tank or the reservoir; while for the supply of the high-level district, for which purpose the tank was erected, a 9-inch branch is taken off the 18-inch pumping main. The cost of the reservoir and tower was £27,500.

The reservoir capacity may, by some, be considered unnecessarily large in view of the fact that the pumping plant is duplicated; but it must be explained that the well supply at Wallasey is supplemented by a supply in bulk from the Vyrnwy aqueduct of the Liverpool Corporation, under an agreement which requires that a minimum quantity of 500,000 gallons per day must be taken, and on this ground, and also to provide for the contingency of a burst in the main, additional storage was obviously necessary.

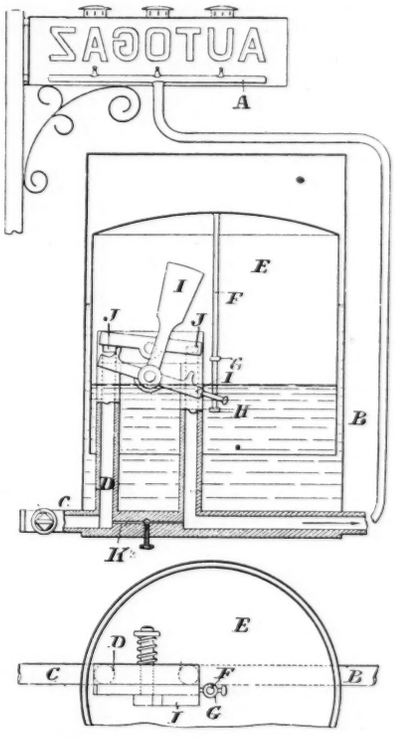
* For an illustrated description of this plant, see "JOURNAL" for Feb. 21, p. 496.

REGISTER OF PATENTS.

Automatic Igniting and Extinguishing Appliances for Gas-Burners.—Horowitz, J., of Paris. No. 13,850; June 18, 1904. Date claimed under International Convention, May 10, 1904.

This apparatus is constructed in such a manner as to control alternately and automatically, from a distant point, the ignition and extinction of any desired number of gas-burners used for illuminating signs of all kinds—either for advertising purposes or as luminous signals.

The group of burners on the pipe A are connected by a pipe B to the distributing apparatus, and by the service-pipe C with the supply of gas. The gas enters the apparatus, passing through the passage D, and escapes into the bell E, which works in a vessel containing a certain quantity of liquid. The bell F, rising under the influence of the gas pressure, carries with it the rod, provided with two stops or tappets G and H, acting in turn upon the extremity of a beam I freely articulated upon the spindle laterally of a box, one of the side walls of which is provided with orifices J. Against this wall is adapted to move a rotary slide turning freely upon a spring shaft, and the displacement of which serves to alternately open or close one of the orifices J.



The controlling device now to be described serves to produce the displacement of the slide in such a manner as to establish communication of the gas-generator alternately with the pipe for supplying the gas and with the service-pipe to the burners. This device is constituted by the counterweighted beam I, provided with projections acting alternately upon one or other of the extremities of the slide. At the lower part of the holder is formed a passage K, adapted to be regulated by a pin valve or cock and connecting the passages for the admission and discharge of the gas for supplying the bye-passes, in such a manner that they always remain lighted during the operation of the device.

In order to start the apparatus, it is only necessary to open the gas-cock and kindle the group of burners. The gas, entering the holder through the passage D, lifts the bell E, which, with its rod and the stop, acts upon the beam I, the counterweight of which causes it to complete its rocking movement from right to left. In its rotation, the beam encounters one of the extremities of the slide, which then rotates rapidly upon its axis, the right-hand orifice J of the slide-valve face of the transmitter opens, and the other orifice is closed. The group of burners, being then kindled, will consume the volume of gas contained in the bell; and this latter descends, in proportion to the consumption, until it reaches, with its rod F and stop G, the beam I. This then pivots again in the opposite direction to that of its first movement; and, acted upon by the counterweight, causes, by means of its other extremity, the rocking of the slide, closing the discharge orifice, and again opening the admission orifice—permitting a fresh displacement of the slide so as to again produce the closing of the cock, and so on in succession.

Gas-Producers.—Hatton, G., of Brierley Hill. No. 18,214; Aug. 23, 1904.

In order to introduce into a producer atmospheric air mixed with a large proportion of steam or water vapour, the methods hitherto generally employed have been either to blow in the atmospheric air by means of a jet of steam at considerable pressure—the air and steam entering the producer as a mixture—or to collect the exhaust steam from steam-engines, which, together with the atmospheric air, is driven into the producer by a fan or blower, or by blowing atmospheric air through a water-tower fed with a supply of hot water, thus charging

the air with moisture, and thence into the producer. The first of these methods is expensive, as the steam under pressure is obtained by the combustion of fuel; for the second and third methods neither exhaust steam nor hot water is always available.

The present invention avoids the disadvantages of these methods, and is carried out as follows: There is a chamber (the vapourizing chamber) connected by a flue or pipe to the base of the chimney of a furnace of any type from which the escaping heat is sufficiently great, and as much heat as is necessary for the purpose is diverted from the chimney into the chamber, into which chamber is also introduced a sufficient supply of water broken into a spray. The heat converts the water into vapour, which is exhausted from the chamber by a fan or blower; and, being mixed with the necessary proportion of atmospheric air, is driven into the gas-producer. The supply of heat and water to the chamber, as also the supply of atmospheric air to the fan or blower, is regulated by valves, so that the right proportions are always under control.

Testing Gas, Air, and Fluids.—Milne, J., and O'Connor, H., of Edinburgh. No. 15,885; July 18, 1904.

In the testing of gas to find the volumetric analysis, the patentees point out that different absorbents are used, which change their colour or nature when a sufficient quantity of the gas has passed through the absorbent. To obtain the quantity of the gas passed through the absorbent, they propose to connect a pump through the cork of a vessel which is partly filled with the absorbent, in such a way that it will either draw the gas in bubbles through the absorbent, or, alternatively, so that it will draw the gas from the vessel containing it, and force it in bubbles through the absorbent. The capacity of the pump being known, the number of the complete actions required to change the colour or nature of the absorbent can be counted, and the quantity of the gas used can be easily calculated. The pump is preferably made with a spring, which causes it to work in one direction automatically.

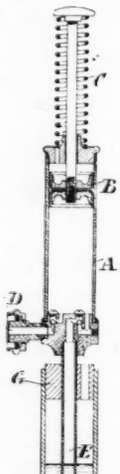


Fig. 1.

Fig. 2.

In fig. 1, A is the pump barrel; B, the plunger; C, the spring which raises the plunger after it has been forced down, and causes it to suck in the gas by the side inlet D; E, the delivery tube; F, the glass containing the absorbent; G, the cork with two holes through it.

The action of the apparatus is as follows: The inlet D is connected to the gas to be tested, and the plunger B is forced down into the pump barrel A, driving out any gas already in the pump barrel through holes in the delivery tube E below the absorbent liquid in the glass F; the gas passing out through a hole in the cork G. As soon as the plunger is released, the spring raises it again, sucking in gas through the side inlet D. This cycle of action is continued until the absorbent changes its colour or nature; and the number of complete cycles or actions is counted.

Fig. 2 shows an alternative method of applying the invention. Here A is the pump barrel; B, the plunger; and C, the spring which raises the plunger after it has been forced down, and causes it to suck in the gas through the space in the glass F above the absorbent. This causes therein a partial vacuum, so that the gas is drawn in through the side inlet D and out through the holes at the bottom of the tube F.

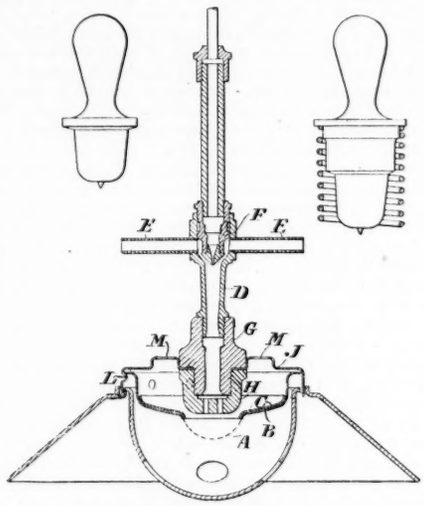
Incandescent Gas-Lamps.—Keith, J. & G., of Farringdon Avenue, E.C. No. 17,584; Aug. 12, 1904.

This invention relates more particularly to incandescent gas-lamps of the kind in which the mixture of gas and air is supplied at high pressure; the object being "to provide an improved lamp wherein the incandescing mantle is formed on, or secured by, the reflector or other fitting of the lamp, and the air inlets to the burner are protected against contamination of the air supply with spent gaseous products." The invention also relates to a method of forming the mantle, which, instead of being already incinerated before being placed in the lamp, is shaped from a piece of unburnt fabric impregnated in the usual way and burnt by the user. "The form of the mantle is such as to facilitate this, so that any inexperienced person may without difficulty quickly make the mantle."

The accompanying illustration shows a lamp adapted to be suspended for factory lighting; also two forms of mandrel employed for forming the mantle.

The mantle A is formed in, and supported by, a dish B of enamelled steel or other refractory material in which an inner dish C lies; the dishes constituting the usual reflecting top body part of the lamp. To form the mantle, the lower dish is taken out of the fitting and laid on an annular support or tripod, or it may be held freely in the hand. The inner dish is lifted out, and a piece of unburnt impregnated fabric is laid in, and the dish C laid on top. A mandrel with a rounded end fitted with a small, sharp point and having a shoulder to limit the depth of raw mantle, is then inserted into the central orifice of the dishes, so as to press out the fabric into a bag. The mandrel may be fitted with a spiral spring in such a way as to hold down the upper dish securely while forming the mantle. The upper or inner dish prevents the edges from puckering, and holds the mantle in place when formed. The fabric is then ignited at the bottom, and shrinks to about half the original size, when it is ready for use.

The fabric for the mantle made from the flat is preferably of an open ordinary woven fabric, but any knitted or crocheted or lace fabric of suitable texture and material may be employed and impregnated in the usual way



The lamp shown is mainly intended to be used with high-pressure gas. It "allows a much higher percentage of air in the mixture than the ordinary inverted burners for low-pressure gas now and hitherto in use; and for this purpose a special construction of burner has been designed." The burner comprises a tube D, with a bore tapering both ways (as described in patents No. 16,955 of 1900 and No. 26,198 of 1901). The air entering the burner is led in by two or more tubes E, and the quantity is adjusted by a nipple holder F being screwed in or out. Two set-screws are provided—one to fix the adjustment and one to prevent unscrewing altogether. Alternatively the air supply may be regulated by a sliding vertical ring or by partially closing the tubes E.

The burner-head H is made of metal of fairly heavy section, as it is in direct connection with the metallic body J of the fitting which is separated from the tube D by an insulator G. This arrangement prevents the burner-head getting too hot locally; the heat being drawn off and radiated by the lamp body J and prevented from rising to the tube D by the non-conductor G.

The products of combustion pass out from the lamp body by two or more holes M, so arranged as to be as far as possible radially from the air intake tubes E. The products thus rise straight up and do not mix with the air entering the burner. The holes may be fitted with short chimneys if desired.

Automatic Gas Lighting and Extinguishing Apparatus.—Vass, D., of Airdrie. No. 1869; Jan. 31, 1905.

This apparatus is for controlling the supply of gas to lamps for street lighting and the like, by means applicable to individual lamps or to groups, whereby on increase of pressure in the main the lamps will be automatically lit, and on lowering the pressure the lights will be extinguished.

Fig. 1 (p. 183) is a sectional elevation showing one modification of the apparatus employed—indicating the gas-supply cut off from the burners by the liquid seal, and the liquid seal displaced by increased pressure to admit gas to the burners. There is also, in fig. 2, a vertical section of a modified form of apparatus, with the gas-passage sealed and with the liquid seal displaced.

As represented in fig. 1, the gas-supply pipe A is connected to the branch B leading to the burners through a bend or trap C; and the lower end of the branch is made in the form of a U tube D, or otherwise connected to a vessel E containing a non-freezing liquid at such a level as normally to form a seal in C. A small bye-pass pipe F is attached to the gas-pipe and terminates at the burners.

In operation, while the ordinary day pressure is maintained, the liquid rises in the branch B and bend C owing to the unbalanced pressure of the portion contained in the vessel E; and the passage from the supply pipe to the burners is sealed. But on an increase of pressure for the night supply, the liquid is forced by the pressure down into the U tube D, and thence into the vessel E—the gas blowing through the water in the part of the tube B above the bend until the water drops by gravity below the junction of the tubes B and C. A free passage is thus left for the gas to flow to the burners. On lowering the pressure in the main, the sealing liquid returns to the level first indicated; and by cutting off the gas-supply to the burners the lights, excepting the pilot-jets, are extinguished.

In the modification represented in fig. 2, the gas-supply pipe A is carried centrally into a dip-tube D^1 having a small bye-pass orifice in its closed upper end and gas-passages in its sides below the normal level of the liquid contained within a vessel E^1 and entering the enlarged lower end B^1 of the pipe B leading to the burners.

In this construction, when the pressure is raised, the liquid within the dip-tube D^1 and surrounding the pipe B^1 above the orifices is forced up into the outer vessel E^1; the gas blowing through the water in the space between the tubes B^1 and D^1 until the water in it falls by gravity, and the gas then flows to the pipe B and the burners, where it is lit by the bye-pass jet. On lowering the gas pressure, however, the liquid resumes the normal level in which the gas-passages

are closed; the supply to the pilot-jet being, however, provided for by the bye-pass orifice.

The apparatus can be constructed to operate at any pressure from 5-10ths over the normal day pressure and upwards; and "as no excess pressure beyond the requirements of the district is necessary

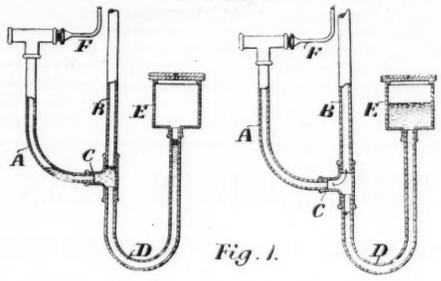


Fig. 1.

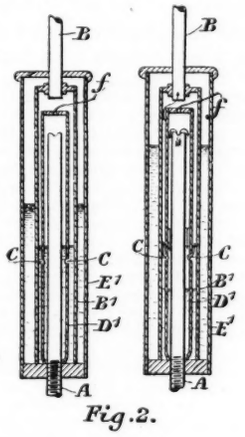


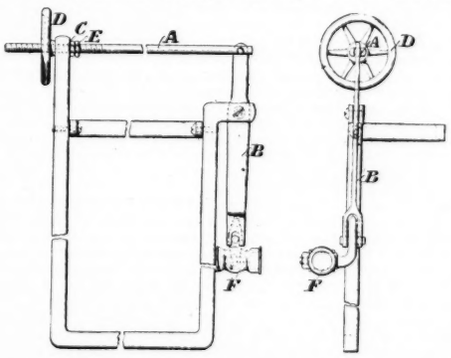
Fig. 2.

for the working of the apparatus, the point of action would (in practice) be at a pressure less than full night-pressure." The point of action and the range can be varied to suit local requirements by altering the position of the gas-passages in relation to the surface of the liquid in the vessel and by varying the superficial area of the vessel itself.

Thermal Gas Cut-Offs.—Bible, G. H, of Coshocton, Ohio. No. 1094; Jan. 19, 1905.

This invention relates to means for automatically cutting off the flow of gas should the flame become extinguished from any cause, and is particularly applicable to stoves, furnaces, and heating apparatus generally, although it may be adapted for fixtures used in the consumption of gas.

The contrivance comprises a frame of approximately U form, with a central stay to connect the side bars, an expansion rod A, and a lever B. The stay is deflected intermediate of its ends to enable it to obtain a purchase upon the fixture to which the cut-off may be applied. One bar of the frame is extended and provided with an aperture C, and the end portion of the other bar is bent outward about at a right-angle, and the lever is pivoted to it. The rod A may be of any metal best adapted for the purpose; and an end portion is threaded to receive a set nut D and jamb nuts E—the set nut being in the form of a hand-wheel. The



threaded portion of the expansion rod is passed through the opening C, and the jamb nuts and set nut fix its position with reference to the frame when arranged for shutting off the gas in an emergency. The opposite end of the expansion rod is pivotally connected to the upper end of the lever B. The lower end of the lever is bifurcated so as to embrace opposite sides of the handle of the valve F, by means of which the flow of gas to the burner is cut off. A pin is passed through the handle and projects from opposite sides of it, and the lower ends of the forked sides are notched to receive the end portions of the pin, thereby insuring positive connection between the lever handle. The valve F is positively operated by external means; and the service-pipe is provided with a second valve, not shown, for regulating the flame or cutting it off when desired.

In the adjustment of the cut-off, the expansion rod is placed in the heating zone of the burner so as to be influenced by the flame, and is caused to expand when the burner is in operation and contract when the flame is extinguished. When the burner is ignited, and the rod A is heated by the flame, the jamb nuts E are turned upon the threaded portion of the expansion rod so as to bear against the inner side of the member of the frame having the opening C, and the set nut D is turned so as to bear against the outer side of the member—the latter being confined between the parts D and E. Should the flame become extinguished, the rod A, in cooling, contracts, and, drawing inward upon the upper end of the lever, moves the lower end in engagement with the handle of the valve F, and operates it so as to shut off the flow of gas.

APPLICATIONS FOR LETTERS PATENT.

13,611.—Dickson, J. H., jun., "Prepayment meters." July 3.
13,628.—Noel, E., "Gasifying liquid hydrocarbons and alcohol for lighting and heating purposes." July 3.
13,641.—Thorp, T., "Gas-chimneys." July 3.
13,654.—Wilson, G., "Stoppers for gas-pipes." July 3.
13,717.—Sutton, C. J., and Rudd, J., "Anti-vibrator." July 4.
13,782.—Thomas, J., and Podmore, A. E., "Inverted incandescent lamps." July 4.
13,818.—Hume, G., "Gas-retarder." July 5.
13,826.—Hutchins, T. W. S., "Gas-generators." July 5.
13,888.—Hammond, W. H., and Bishop, E. W., "Locks for the money-drawers of coin-freed gas-meters." July 5.
13,922.—Crowther, D., "Gas-engines." July 6.
13,984.—Wormald, A. H., and Brooke, W., "Locking and removable taps or valves." July 7.
13,990.—Beardmore, W. and Co., Ltd, and Stokes, J. W. B., "Measuring and recording the volume of gases flowing through pipes." July 7.
14,090.—Towns, W., "Gas-producers." July 8.
14,098.—Anderson, E. W., and Kynoch, Ltd., "Suction gas-producers." July 8.
14,111.—Turner, W. V., "Pressure-reducing valve." July 8.
14,128.—Rustige, F. J. H., "Gas-valves." July 8.

Scarcity of Water at Otley.—In consequence of the long-continued drought, residents on the outskirts of Otley have been notified that the supply of water will be cut off except for a very limited period; and as this chiefly affects the residential portion of the district, a good deal of dissatisfaction has been expressed. The various factories and workshops are now feeling the shortage to a great extent; and unless rain comes quickly, the consequences may possibly be serious.

Plymouth Water Supply.—At a meeting of the Plymouth Town Council yesterday week, Mr. A. R. Debnam, the Chairman of the Water Committee, stated that the Corporation were supplying 500,000 gallons of water a day to Devonport. Whether they would be able to continue to do so would depend upon the demand in Plymouth. Though they had a large supply at Burrator, they had not the means of bringing an unlimited quantity into the town; and if the pressure of a long drought came, it would be as much as they could do to satisfy the needs of Plymouth. In such an event, it would be utterly impossible to supply Devonport. With regard to Yelverton, which was outside the gravitation area, it had been proposed to put down an extra hydraulic ram and construct other works to ensure the continuance of the supply. The capital expenditure required was about £700; and it had been proposed that those who would benefit should bear their share of the cost. But they did not seem willing to do this; and the Committee had decided not to proceed with the scheme.

Chesterfield Water Supply.—Last week, on the invitation of the Chairman, Mr. F. G. Harrison, the members of the Chesterfield Rural District Council visited the works at the new reservoir now in process of construction at Barbrook. The reservoir was commenced three years ago, but proceeded so slowly and unsatisfactorily, while in the hands of the Contractor, that it was eventually taken over by the Council. The work has since been continued without a contractor—Mr. Colin Clegg, of Sheffield, being in charge, with Mr. E. M. Eaton, as Consulting Engineer. The storage capacity will be 100 million gallons, the water area 30 acres, and the area of the gathering ground 1038 acres, all moorland. The water line, when full to the overflow conduit, will be 1070 feet above sea-level. The original estimate for the cost of constructing the reservoir was £50,000; but this sum has been expended, and several thousands besides, and the work is far from complete. It is calculated that it will be out of hand two years hence, by which time a sum of at least £80,000 will have been expended. Unexpected difficulties have been met with in the matter of a sound foundation.

Lamplighters' Duties and Holidays.—The Plymouth Street Lighting Committee recently had under consideration two questions relating to the employment of lamplighters. One was a request from the men for an occasional Sunday off duty, and the other was an inquiry by the local Labour Council if there were any men employed as lamplighters who were engaged in other occupations and employed substitutes to do their work for the Corporation. The Committee decided against the proposed Sunday holidays, and with reference to the other matter informed the Labour Council that they knew of no such cases as were alleged. When the matter came before the Town Council yesterday week, Alderman Radford, the Chairman of the Committee, said they would have liked to give the men an occasional Sunday off duty; but the nature of the work made it very difficult to do so. Since the Corporation took over the street lighting from the Gas Company, they had increased the wages of the men and given them seven days' holiday a year. With regard to the complaint of the Labour Council, the duties of the lamplighters were simply to light and extinguish the lamps daily according to a time-schedule, and clean the lamps once a week. They did not know of any case in which these conditions of service were not complied with. Outside official hours, the men were at liberty to take other work.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bill read a second time and committed : Malvern Water Bill.

Bills read the third time and passed : Andover Lighting and Power Bill, Skegness Water Bill.

Bills Royal Assented ; Hythe Corporation Bill, Mansfield Corporation Bill, Seaham Gas Bill, Swansea Corporation Bill.

The Esk Valley Power-Gas Order Confirmation Bill was presented, read the first time, and, pursuant to the Private Legislation Procedure (Scotland) Act, 1899, deemed to have been read a second time and reported.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Lords Bills read a second time and committed : Gas and Water Orders Confirmation (No. 2) Bill (relating to Tavistock and Ystalyfera Gas, and Dorking, Maidenhead, and Wey Valley Water), Rhymney and Aber Valleys Gas and Water Bill.

Lords Bills reported : Gas and Water Orders Confirmation (No. 1) Bill (relating to Bolsover, Formby, and Stavely Gas, and Denbigh and Hayling Water), Shepton Mallet Gas Company (Electric Lighting) Bill, Southport, Birkdale, and West Lancashire Water Board Bill.

Lords Bills read the third time and passed : Gas Orders Confirmation Bill (relating to Aberystwyth, Haslemere, Hayling Island, Sandiacre, and Stanford-le-Hope), Gas and Water Orders Confirmation (No. 1) Bill, Hessle Gas Bill, Tees Valley Water Board Bill, Western Valleys (Mon.) Water and Gas Bill, Whitby Urban District Council Bill.

UNOPPOSED BILLS.

Shepton Mallet Gas (Electric Lighting) Bill and Gas and Water Provisional Orders Bill.

On Thursday, Mr. Laurence Hardy presided at a meeting of the Committee of the House of Commons which deals with Unopposed Bills ; the measures considered being (*inter alia*) the Bill to empower the Shepton Mallet Gas Company to supply electricity within their limits of gas supply, and the Bill to confirm Provisional Orders made by the Board of Trade, under the Gas and Water Works Facilities Act, 1870, relating to Bolsover, Denbigh, Formby and Staveley Gas, and Hayling Water. The usual formal evidence having been tendered, and some drafting amendments, to meet the requirements of the Local Government Board, made in the first-mentioned Bill, both measures were allowed to proceed.

THE SUPPLY OF ELECTRICAL FITTINGS.

The London County Council (General Powers) Bill engaged the attention, during the past week, of the Select Committee of the House of Lords of which the Duke of Northumberland is Chairman. It will be remembered that when the Bill was before the Police and Sanitary Committee of the House of Commons in May, several Gas Companies petitioned in opposition to the clauses relating to the supply of electrical fittings by Metropolitan Borough Councils ; and certain amendments were introduced. No evidence was now given in support of the clauses ; and, without calling on the witnesses for the petitioners, the Committee on Friday deleted them.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Junior Institution of Engineers.

SIR,—Adverting to the "Coming-of-Age" celebration of this Institution, and to the paper read by Mr. W. J. Tennant (Past-Chairman), and referred to in your issue of the 4th inst., no better person could have been chosen for writing an historical sketch. But as it naturally precluded him from stating what part he had played in the earlier development of the organization, I feel constrained to supply the omission. As I joined the Society at the same time, and continued the colleague of Mr. Tennant on the Council, succeeding him as Vice-Chairman, then as Chairman, I am so fully acquainted with all that passed as to be in a position to speak from personal knowledge.

Succinctly, therefore, let me state that the Society in 1886 was a mere handful ; and it was at this stage that Mr. Tennant began to exert that influence which virtually meant such an extension as to practically found a new Society. He moved and pressed upon the Committee that the Society's existence should be brought before the notice of all the engineering firms in London. He also was the originator of excursions and visits to works at regular and frequent intervals, and to which is so largely due the success of the Society. He was also chiefly responsible for the Society taking the plunge of removing its place of meeting from its local habitation in Lambeth to Westminster ; and it was from this change that in reality the Society began seriously to take its place among existing Institutions. With his joining, and the foundation work he did in suggesting and helping to carry out the re-erection of the local structure on its broadened and improved basis, we have the beginning of an enlarged Institution whose "Coming-of-Age" celebration has just been held.

Others after Mr. Tennant's and my own period of chairmanship have contributed in no small degree to continuing and placing the Institution on sound business lines ; but it is probably unnecessary to mention any other names. By adding these remarks to Mr. Tennant's paper I feel that I am only giving the credit which is his due, although, from a friendship of over twenty years' standing, I can vouch he would be the last man in the world to acknowledge such credit himself.

SIDNEY BOULDING,
Past-Chairman.

28, *New Bridge Street, E.C., July* 10, 1905.

MISCELLANEOUS NEWS.

THE PUBLIC LIGHTING OF WESTMINSTER.

Competition of Gas and Electricity.

At the Meeting of the Westminster City Council last Thursday, the subject of the lighting of certain streets in St. James's, which had been before the Council on the 6th of April and the 1st of June, as reported in the "JOURNAL" at the time, was again under consideration. It may be remembered that the report of the Works Committee, recommending the acceptance of the tender of the St. James's and Pall Mall Electric Lighting Company for maintaining and lighting 66 lamps in the streets in question for £17 each per annum for five years was referred back in April, and a similar result followed the presentation of their neutral report in June. They now recommended, for the second time, that the tender be accepted. The other tender submitted was that of the Gaslight and Coke Company at £15 1s. per lamp per annum for lighting and maintenance, and £10 per lamp for installation ; the payment of the latter sum to be spread over five years, at £2 per annum, without interest. Pursuant to instructions, the Town Clerk (Mr. John Hunt) submitted a report upon the question. It showed that at present the total annual cost of the street lighting of Westminster is £40,462 18s. 6d. ; £26,789 18s. 6d. being for electric lighting, and £13,673 for gas. In the course of his report, the Town Clerk said :

Except in the parish of St. James, it is impossible to make a reliable comparison between the cost of gas and electric lighting in those streets which are at present lighted by electricity. Taking the tender of the Gaslight and Coke Company of March 10, 1905, for 900-candle power lamps at £15 1s. per annum as equivalent to the arc lamps, and the 42-candle power lamps at £3 2s. 10d. per annum as equivalent to the incandescent electric lamps, the cost of gas would be as shown in the following table :—

District.	Arc Lamps.	Incandescent Lamps.	Cost of Gas Lighting.
St. James	66	..	£993 6 0
St. Martin	123	..	1,851 3 0
St. George	954	175	14,907 10 0
	1143	175	£17,751 19 0

The cost of electric lighting is, as already stated, £26,789 18s. 6d. ; showing an apparent difference of £9037 19s. 6d. in favour of gas lighting. There are, however, three disturbing elements which have to be taken into account. In the first place, in order to substitute gas for electricity, the lamps would have be converted at a cost of £10 per lamp, payable in instalments of £2 per lamp per annum during the first five years ; and there would be 1318 lamps to be converted, which would add £2636 per annum during the first five years to the cost of gas lighting—making a total of £20,387 19s. per annum. This would reduce the difference between the cost of gas and electricity during the first five years to £6401 19s. 6d. per annum. In the second place, the tender of the Gaslight and Coke Company is not for a definitely fixed price, but is for a price subject to an increase or decrease of 9s. 6d. per lamp for every 1d. per 1000 cubic feet increase or decrease in the price of gas for public lighting. This price is now the low one of 2s. 2d. per 1000 cubic feet. The average for the last ten years has been 2s. 3¼d. There is, therefore, more probability of an increase than of a decrease in price ; and an increase of a single penny per 1000 cubic feet, taking 1318 lamps at 9s. 6d. a lamp, would mean an increase of cost of £626 1s. a year. In the third place, to compare the cost of gas with electricity, if the present tender of the Gas Company is accepted as the basis of comparison, the price at which the electric supply companies would be willing to supply electric light were there no contracts, and they were in competition with the Gas Company, should be taken as the basis of the cost of electric light, and not the prices under existing contracts.

At present the main streets in the parish of St. James are lit by electricity and the remaining streets by gas. The only practical question now before the Council is the lighting of the main streets of that Parish, though the course adopted in this case may materially affect the Council's future policy when contracts for lighting other streets in the City are under consideration. As regards the cost of electric lighting in the main streets of the parish of St. James, the figures given above are based on the price in the current contract with the St. James's and Pall Mall Electric Light Company. Under their tender now before the Council, however, the Company offer to light and maintain the lamps for the sum of £17 per lamp per annum, which for the 66 lamps mentioned would amount to £1122 per annum, or an annual saving on current prices of £875 10s. per annum. The Company have further undertaken to furnish a minimum candle power in each lamp of 900, instead of 700 as quoted in the specification upon which their tender was based, without increasing the price quoted in their tender. The Gaslight and Coke Company, since the submission of their tender, have stated that, should they be entrusted with the lighting, they propose to supply a light averaging 1000-candle power, and that they would be prepared to accept the insertion of 900-candle power in lieu of 700-candle power in the penalty clause of the contract ; also that they are willing to give the Council the option of renewing the contract for a further term of five years beyond November, 1910, as evidence that their tender was not put at a "below cost" figure with a view to obtaining an increase of price at the expiration of five years. The Gas Company's tender for lighting and maintenance, at £15 1s. per lamp per annum, amounts to £993 6s. per annum for the 66 lamps,

subject to the possible fluctuation in the price of gas referred to above. But a further charge of £10 per lamp for the conversion of the existing lamps would have to be incurred, which the Company are prepared to accept in instalments of £2 per lamp per annum. The total annual charge for the conversion, lighting, and maintenance of the 66 lamps would therefore amount to £1125 6s. per annum during the five years of the contract. It will thus be seen that during the first five years, when the cost of conversion has to be included, there is a difference of £3 6s. per annum in favour of the Electric Light Company's tender; but subsequently, presuming there were no revision of the price of gas or electricity, there will be a difference in favour of the Gas Company's tender of £128 14s. per annum—a difference which would disappear on a rise of 4d. per 1000 cubic feet in the price of gas for public lighting.

The TOWN CLERK announced the receipt of a letter from the Gas Company offering to agree to the insertion of a clause in their contract that there should be no variation in price during the five years; also asking that permission be given them to erect six lamps, of the kind they proposed to put up under their tender, in Regent Street, or some other suitable place in the parish.

The adoption of the report having been formally moved,

Alderman EMDEN moved, as an amendment, that it be referred back to the Committee, with instructions to them to accept the Gas Company's offer to experimentally put up the six lamps they proposed to erect. He said he was well aware that he would be met with the argument that this contract was only a little one, and that it should be allowed to go on; leaving the whole question of gas *v.* electric lighting till other electric contracts had expired, when the matter could be dealt with in a comprehensive way. But he did not believe in this policy. He held that now that they were face to face with the problem, they should deal with it. Those who supported electric light had not a single argument except the fact that a petition from ratepayers in the parish had been presented to the Council in favour of electricity. But the persons who signed this document did not know the possibilities of gas. Large cities like Paris were going in for gas in preference to electric light, more especially in the shopping centres; and the same was happening in Vienna. Liverpool and the City of London were two of the many places in Great Britain where gas was being substituted for electric lighting. When all round them there was progress in this direction, it was proposed that the City of Westminster should bind itself for another five years to electric light. Why? Merely so that the matter should be considered on a comprehensive basis. The argument was monstrous and ridiculous.

Mr. EVERITT remarked that it would be very unfair to the Electric Light Company to again refer this matter back. The area covered by 66 lamps was altogether too small to allow of fighting the large question of gas *v.* electricity for street lighting upon it.

Mr. DENNIS contended that, as the whole position had been altered by the Gas Company agreeing not to vary their price for five years, the matter ought to be referred back. He did not know what had been going on behind the scenes; but he knew that gas was the best illuminant, and he would vote for it.

Lieut.-Colonel HILL JAMES said he had recently been in Paris, and had admired the illumination of the main streets of the city by gas. They could not be beaten anywhere. In Vienna and in Berlin gas had been substituted for the electric light; and the same had been done in the City of London. Liverpool—the second city in England—was now lighted with incandescent gas; electricity having been abandoned as far back as 1896. Leicester and Reading had followed suit. Nearer home, according to an answer given in the House of Commons a few days ago, the Board of Works had decided to light Parliament Square by means of the same gas-lamps which had proved so successful in New Palace Yard. With all these instances before them, why should the City of Westminster hesitate in substituting the better and cheaper light for electricity, more especially as the Gas Company had guaranteed 900-candle power for each lamp, with a possibility of reaching 1000 candles? Those ratepayers who had petitioned in favour of the electric light would not have objected to the use of incandescent gas if they had known its possibilities. Since the Town Clerk had written his report, the situation had been changed by the Gas Company offering to insert a clause in their contract providing against any increase in the price of the gas during the next five years. He could not understand why the Council should go on blindly and shackle themselves to the Electric Light Company for five years.

Mr. J. M. GATTI asked why such extraordinary tenderness was being shown to the Gas Company by permission being given them to amend their tender. In his opinion, the report should not be referred back.

Captain JESSEL, M.P., pointed out that the Electric Lighting Company had also been permitted to revise their tender.

Mr. EVERITT: They were merely asked to do so with regard to candle power.

Captain JESSEL said they had an opportunity of revising their tender, and the Gas Company had done exactly the same thing. There was, he contended, no difference between the two cases; both the parties had revised their tenders, and the Council were in a position to consider them from exactly the same point of view. They had simply to consider what was the best in the interests of the ratepayers. Looking at the matter from this standpoint, he held that the tender of the Gas Company should be accepted.

Mr. BRADFORD contended that was not the time, when there were only 66 lamps in question, to consider whether or not they should have electric lighting or gas in Westminster. When other contracts expired, the whole matter could be gone into, and decided upon in a comprehensive manner.

Mr. SPENCER-SMITH, the Chairman of the Works Committee, said he did not object to the report being referred back, though he took exception to the instruction, and also thought that the experimental period should be reduced to three months.

Alderman EMDEN offered to alter his amendment accordingly.

Mr. SPENCER-SMITH added that his own idea was that the offer of the Gas Company to undertake further experiments should be accepted. He did not mind saying he favoured gas in preference to electricity.

The question was then put, when the amendment was lost by 31 votes to 18; and the recommendation of the Committee, accepting the tender of the Electric Light Company, was adopted.

LABOUR TROUBLE AT THE BOLTON GAS-WORKS.

We learn from a local paper that a serious dispute has arisen in the Bolton Corporation Gas Department on the question of wages and conditions of labour; and it culminated on Friday in the tendering to the Gas Committee of notices by 131 of the workers, terminable in the case of all except the lamplighters in seven days, the remainder being due to expire in a fortnight. The men ask for advances of 1d. to 6d. per day. In the course of an interview with a representative of the paper referred to, Mr. Alfred Potts, the General Secretary of the Bolton and District Gas-Workers' Association, supplied the following details regarding the state of affairs from the men's standpoint. He said that following an application made in October last by the men at Lum Street and Gas Street works, three months' notice was given; but the Gas Committee held that six months' notice should have been the period, and that the notices should have been tendered in November. The men objected to this ruling, and contended that it was disproved by a notice they had received on behalf of the Committee in the month of May. Out of consideration for the public, the workers did not wish to take action in December unless they were compelled; and the Committee asked that the question should be placed before the men in a favourable light, so that it might stand over until May, when it should be considered upon its merits. The men complied with the request. On the 26th of May they were invited to attend a meeting of the Gas-Works Sub-Committee, when conditions were drawn up, which implied increased work and reduced pay; and to these the men objected. Subsequently a resolution was received from the Works Sub-Committee proposing to allow increased wages of 1d. per day for yardmen at the two works and coal wheelers at Gas Street. The general body of the men considered the matter, but could not accept the conditions; and in order to justify their claims, they gave the Committee information obtained from the principal towns in Lancashire. They asked for a special meeting to be held to thoroughly consider the question; and on the 7th inst. they met the Committee. The interview, however, proved abortive. A report was presented to the general body of workers last Tuesday, and it was decided that it was time some definite action should now be taken. Accordingly, their notices were tendered as already stated. All with the exception of 32 will expire on the 21st inst., and the others on the 28th. There are altogether about 400 gas workers, including fitters, in the town. The Gas Committee held a special meeting on Saturday afternoon, and decided that the notices given should be received, and arrangements made to fill the places of those who had not withdrawn their notices by this (Tuesday) morning.

DEVONPORT GAS UNDERTAKING.

The Water-Gas Question—The Recent Litigation.

The Devonport Town Council, at their Meeting last Thursday—the MAYOR (Mr. E. Blackall) presiding—again had under consideration the question of providing water-gas plant as a means of supplementing the present production of the works. It was stated by the Gas Committee that the Gas Engineer (Mr. J. W. Buckley) had reported having made certain suggestions to Messrs. S. Cutler and Sons with reference to their tender for the carburetted water-gas plant, and that the Contractors had accordingly submitted an amended tender adapting the plant to the site upon which the old purifiers originally stood, and for the erection of the buildings for the accommodation of the plant and all the additional machinery necessary for the installation of the system. The amended tender was made up as follows:—

Originally accepted tender for plant and oil tank . . .	£4875
Deduct for coke hoist and buggies, oil-storage tanks, yard mains, rotary meter.	1045
	£3830
Add for steel buildings, comprising generator, engine, and boiler houses	2345
Add for coke elevating and conveying machinery with steam-engine, &c., station meter, yard mains, oil-storage tank, boiler, and steel chimney	2010
	£8185

The Contractors stated that if they had immediate instructions to proceed with the work, they would have the plant in working order by November next. The Committee resolved that the originally accepted tender of Messrs. Cutler and Sons for plant and oil tank (£4875) be altered in accordance with the amended tender for plant, buildings, and machinery, that the amended tender be accepted, and the Contractors instructed to immediately proceed with the work. It was also resolved that the Gas Engineer be instructed to prepare the foundations for the water-gas plant buildings, at an estimated cost of £350.

Alderman HORNBROOK, the Chairman of the Gas Committee, in moving that the minutes be confirmed, said the Committee had had practically nothing to do with the matter. He was not himself consulted with regard to the alteration of the tender, and had not a single word to say upon it; it was purely a matter of arrangement between the Engineer and the Contractors. He should therefore leave it to the Engineer to say what he had to say about it. In the Committee there was not a dissentient voice. The changes which had been made represented a saving of £6000 or £7000 upon what had been proposed previously. Upon what had gone before, however, he did not want to say anything more. The Council had appointed an Engineer, who had gone thoroughly into the matter, and who told them that not only could he effect this saving in the original outlay, but that he would stake his reputation on saving the town £1500 a year in the cost of producing the gas.

Mr. BUCKLEY then read a report on the works, in the course of which he stated that during the past two winters the supply of gas to the town had been deficient, mainly through an insufficient number of

retorts and badly constructed fittings. If the weather during the approaching winter should be at all severe, the demand for gas will be considerably in excess of that of last year; and if no extra provision was made for increased production, the consumers would be much inconvenienced. As the season was so far advanced, there appeared to be only one way of getting over the difficulty in time for the coming winter—by the erection of a carburetted water-gas plant. The original position selected for this plant was the worst that could have been chosen; and so a new site was decided on. Owing to the altered position, the method of raising coke, and other changes, the plant would be more economically worked. He had examined the tender of £8185 of Messrs. Cutler and Sons, and considered the price reasonable and just. If not less than 25 per cent. of the total production was water gas, he estimated that, after repayment of loan and interest on the capital required, there would be a net saving to the ratepayers of about £1500 per year, which would be mainly due to the adoption of a better method of making gas than the antiquated one in use, especially in No. 1 retort-house. The original estimate for a plant of similar capacity was £15,000; so that the present tender showed a decreased capital expenditure of over £6000. The amended tender was due entirely to suggestions which he had made to the Contractors. Neither the Chairman nor any member of the Committee had had anything to do with the matter.

Alderman LITTLETON said he wished to take the opportunity of saying how much he was indebted to Mr. Cutler, jun., for the great amount of trouble he took in explaining the whole details of the scheme to him. He showed him they could get all that was wanted from a smaller site. The land for the extension of the gas-works was one of the roughest sites that could be used for the purpose; but the late Gas Company considered it the right policy to acquire the land, and the Committee agreed, because there was really no other available. When Mr. Buckley told them that by expending £8500 they would save £1500 a year, he naturally supported him; and he did so the more heartily because he thought there was really more in it than the immediate saving. His opinion was that if they adopted water gas they would not need to put up so large a retort-house as was originally intended—he believed Mr. Buckley agreed with this—and that in this way they would avoid a large capital expenditure, and so effect a big saving. He had thought that Mr. Hornbrook would have taken the opportunity that day to make a declaration about the past; and he put it to him that in fairness he might like to say something in the Council Chamber. In the chamber he had said that a gentleman who had gone had done certain things that he ought not to have done. Mr. Hornbrook, however, had retracted all the statements he had made about this gentleman. He noticed that Mr. Hornbrook said "No." Well, the Council ought to know where they were. If they were going to keep their servants and officials in the position that they ought to be in, they should be careful not to take any mean or undue advantage of them. If Mr. Hornbrook was prepared to work hand-in-hand with those who had the interests of the town at heart as much as he had, he should also be free and frank with them. Let them banish such things as innuendoes about public servants. If there was anything to be said, let it be put on record. In reference to the late Engineer, he personally took the greatest amount of trouble to find out if there was anything at the bottom of the allegations which were made; but though he questioned everyone who might be expected to know anything about the matter, he did not get any information which convinced him that there was a foundation for the gossip. He hoped Mr. Hornbrook would give them some authority about the matter, and some assurance. If he was going to retain the position of Chairman of the Gas Committee, he should assure them that nothing should be done except in a systematic and proper way, and that there should be nothing detrimental to the interests of anyone.

Alderman ROLSON thought that the less they said about the past the better. In consequence of what had been said before, there had been trouble; and if they went on speaking about it, there might be trouble again.

The MAYOR said they wanted to have done with it for ever, for the credit of the town and themselves. He should rule everyone out of order who went further into the matter of the recent actions, with which the Council had nothing to do. No doubt the Chairman of the Committee would at the close of the debate make a wise and discreet statement which would satisfy everybody.

Mr. H. BANBURY thought that Mr. Littleton had gained some advantage over the rest of them by the manner in which he had been allowed to refer to what had gone before. Many of them could not forget the past, and he did not intend that it should be buried, but rather that its lessons should be taken to heart. They could not forget the previous estimate of £15,000 for the installation of the carburetted water-gas plant. The difference between that and the present one of £8000 was too great to be passed over lightly.

Mr. P. C. GOODMAN congratulated Mr. Buckley on the fact that he had had an opportunity of reading his report, and also on the report, which confirmed in every detail what was advocated by the late Manager. The sum of £4000 had been lost to the town owing to differences of opinion and bad working between the late Manager and the Committee. The Chairman occupied a position he ought never to have held.

Mr. GEORGE considered that the Council were greatly indebted to Mr. Hornbrook for the position he had taken up. It was a pity he did not take up this position earlier. Many of them were convinced that thousands of pounds had been spent at the gas-works for which they were getting no return.

Mr. MONK remarked that he had all along contended that no water-gas scheme was necessary, and this was still his position. Early next year the Admiralty's demand for their gas would be much lessened, owing to an installation of gas in the Dockyard. Mr. Banbury had maintained that the reduction in the present estimate justified the position of those who had previously voted for carburetted water gas. It really justified those who had been opposed to the expenditure of £15,000.

Mr. BANBURY said the former estimate was that carburetted water gas would cost £15,000, as against £8000 for blue water gas. Now their position was that carburetted water gas was to cost £8000.

Mr. MONK replied that he was not going to raise the question of the wisdom of proceeding with the work. They had arrived at a stage when the Engineer was allowed to do work which the late Engineer was not permitted to do.

Alderman HORNBROOK said he was not going to allow Mr. Littleton, with all his kindly feeling, to "draw" him. Once was enough. What they took credit for was that right triumphed over wrong so far as the immediate matter before the Council was concerned. Some of them might be for a moment under a cloud; but before three years were over Devonport would know who its true friends were. He had previously said that carburetted water gas would not cost £15,000, nor even £10,000; and they triumphed to-day over those who had tried to mislead them.

The Committee's recommendation was adopted.

CHEAPER GAS FOR POWER AT BIRMINGHAM.

At a Meeting of the Birmingham City Council to-day (Tuesday), the Gas Committee will report that they have completed the purchase of coals for the current year on favourable terms; and in view of the saving effected, they have reviewed the charges for gas supplied for use in engines. In July, 1903, reductions in the prices to be charged for gas were sanctioned by the Council, based, as hitherto, on the quantity used by a consumer in one building, regardless of the purpose to which the gas was applied; and the lowest charge in the scale was 1s. 10d. per 1000 cubic feet, less a discount of 5 per cent. on the usual terms, where the volume of gas supplied exceeded a million cubic feet per quarter. The Committee have received communications from manufacturers directing attention to the reduced charges made to their competitors by undertakings in surrounding districts for gas used for motive power; and inquiry shows that such arrangements are made in the following manufacturing centres: Bristol, Bury, Darlington, Derby, Glasgow, Leicester, Longton, Manchester, Newcastle, Nottingham, Rotherham, Sheffield, Stafford, Stockport, South Shields, Stoke-on-Trent, Wigan, and also in the neighbouring towns of Oldbury, Smethwick, Stourbridge, Walsall, West Bromwich, and Wolverhampton. The attention of the Committee has also been directed to the development and perfecting of appliances for the manufacture of a gas that can, under favourable conditions, be substituted for Corporation gas for motive power purposes; and, after fully considering the position, they will recommend that all gas for use in engines, irrespective of quantity, shall, as from the next quarterly reading of the meters, be supplied at the lowest current rate of 1s. 10d. per 1000 cubic feet, with a discount of 5 per cent. on the usual terms, or slightly under 1s. 9d. per 1000 cubic feet net. Gas used for engines will, as hitherto, be registered through separate meters. There are, it is stated, between 2000 and 3000 users of gas for power purposes in the district of the Birmingham gas supply; while the amount of gas so employed is about 15 per cent. of the entire output. Many of these consumers have complained of the disadvantage they are under through their competitors in other places, including immediately adjoining districts, having gas supplied to them for power at a reduced charge. The stress of this competition has also led many of the larger users to put down gas-producers of their own. As will be seen, it is now proposed to put the user of gas for power upon the rate hitherto only enjoyed by the largest consumers. At present consumers of under 50,000 cubic feet per quarter pay 2s. 6d. per 1000 cubic feet; and placing them on the minimum scale will be equivalent to a reduction in their case of 8d. per 1000 feet. For consumers of between 50,000 and 250,000 cubic feet, the proposed reduction works out at 5d. per 1000 feet, and to consumers of between 250,000 and 1,000,000 cubic feet, at 2d. The abatement is only for such gas as is used for power.

COMPETITION OF GAS AND ELECTRICITY AT COVENTRY.

A resident in Coventry has been moved to write to one of the local papers on the subject of the policy of the City Council in running the Gas and Electric Light Departments as entirely separate concerns, both belonging to the ratepayers, and supplying light and power.

The remarks of the critic in question are as follows: "Reference is often made to a scheme which the Council sanctioned some three years ago for the expenditure of £75,000 to purchase plant, whereby a deficiency of £1800 then existing would be wiped out. The report, as presented by the Electric Light Committee, appears to have accomplished its object; but when the electric light and gas are considered together, and the facts dealt with that are known to all, a very different result is obtained. Nearly the whole of the customers that have been acquired by the electric light have been lost to the gas; and in proportion as the revenue from these customers assists the electric light to make up their loss, and relieves the rates, so the ratepayers lose the amount of net profit which they have been in the habit of receiving from the gas for the relief of the rates. It simply means a transferring of customers from the gas to the electric light to assist them in their emergency. During this period, the plant in the Gas Department could have supplied the whole of the customers of the electric light without any further expenditure of capital. This being so, from a financial point of view, the £75,000 or £85,000 expended has brought in no return whatever to the city exchequer. A point that is often dwelt upon is the very low cost per unit for making current. This counts for little if one bears in mind that, while the gross profits of the gas are about 26 per cent., those of the electric light are 62 per cent. In the former case we have a net profit of several thousands, while in the latter it is *nil*. One customer of the Corporation had been using a gas-engine for generating current for lighting, upon which the Corporation were making a profit. The Electric Light Department replaced the gas-engine with a motor, and now the customer obtains current for lighting at the same price as charged for motors."

PURITY OF WEST HAM GAS.

Proposed Prosecution of the Gas Company Abandoned.

Readers may remember that on the 9th of May the Corporation of West Ham adopted a report of the Highways Committee, recommending that the Deputy Town Clerk be instructed to take proceedings against the West Ham Gas Company for supplying, on the 7th and 8th of March, gas containing more than 25 grains of sulphur in 100 cubic feet. The report of the Gas Examiner (Mr. W. C. Young) showed the quantity of sulphur to be 26·9 grains per 100 cubic feet. A copy of the report was forwarded to the Secretary of the Gas Company (Mr. A. G. Snelgrove), who replied that the Company's tests made on the dates named had given 20·90 and 20·17 grains respectively. Since the receipt of the report, they had tried one-half of the remaining liquor, and could not discover any mistake in the tests. On examining the apparatus at the testing-station, however, they found the water-line low in the sulphur-test meter, which would make a slight difference in the test carried out by the Gas Examiner. This communication was forwarded to Mr. Young; and after his reply had been considered, it was decided to prosecute. At the meeting of the Corporation last Tuesday, the Committee reported that they had had an interview with Mr. Young, who stated that the excess of sulphur was very slight, and that it was extremely doubtful if a conviction would be obtained. He added that testings which had since been made showed better results. Having given the matter careful consideration, the Committee recommended that no further action be taken; and this was agreed to.

GAS-WORKS INSPECTION AT LONGTON.

Responding to an invitation by the Gas and Electricity Committee the majority of the members of the Longton Town Council last Wednesday paid a visit of inspection to the works under their control. At its conclusion, the company were entertained to tea by the Committee, after which some interesting speeches were delivered.

Thanking the visitors for their presence, Alderman Brookfield, J.P., the Chairman of the Committee, said that he would not be exaggerating if he placed the value of the gas-works at £200,000. In the early days too much was taken out of revenue and handed to the town; and they borrowed a corresponding amount of capital; but of recent years the Committee had been meeting a great deal of expense out of revenue. All the extensions of mains and plant during the last four or five years (excepting the installation of the electricity station) had been dealt with in this way, inclusive of the water-gas plant. By March 31 next, no less than £7000 would have been paid off in this manner; while other expenditure in various directions, amounting to about £2000, would have been similarly dealt with. In addition, they had agreed to reduce the price of gas 2d. per 1000 cubic feet from next October; and personally he believed that, if the concern was to be made the greater success they desired it to be, they would have to eventually lower the price of gas considerably more by gradual stages. This would ensure the success of the gas-works by leaps and bounds. He believed the town was on the eve of improved trade, and this would mean an increasing demand for gas. The present success of the works was mainly due to the efforts of their able Engineer and Manager (Mr. W. Langford), who was a conscientious and persevering official, sharing the confidence of the Committee. Mr. Langford not only made excellent suggestions for saving and making money, but demonstrated their utility with successful results. He had been frequently asked if the Gas Committee kept the plant up to date; and he thought the day's inspection would prove that the Committee were efficiently discharging their duty. They were guided, of course, largely by the advice of the Manager, since whose advent a great revolution had taken place in the fortunes of the concern. The general appearance of the works was a splendid testimonial to the conduct of the undertaking.

The Vice-Chairman, Mr. W. Hulse, also thanked the councillors for their presence. The idea of asking them to inspect the works, he said, was to prevent any question being put or statement made through a want of closer knowledge which would convey an impression to the public that the undertaking was not being efficiently controlled. He thought the visitors would agree that the orderly and tidy appearance of the works indicated success. They had a Manager who did his very best for the gas-works, and who could prove that the consumers were getting the best gas for their money and plenty of it. Mr. Langford was anxious that the town should have a good light as cheaply as possible; but he (Mr. Hulse) could not follow Alderman Brookfield in saying they were to have a wonderful reduction in price. They would have to walk in this direction very carefully; and he believed that by the end of the next financial year they would find they had conceded as great a reduction as possible at present, and given to the town as much as they could afford. The system of paying more out of revenue, instead of raising loans, proved satisfactory to the town.

Subsequent speeches similarly eulogized the services of the Engineer and his staff. Alderman Edwards congratulated the Committee upon the splendid report just issued; but, while agreeing with a reduced price for gas, he warned the Committee against going too far. Mr. Potter, on the other hand, advocated a greater reduction than the promised 2d.—contending that, as the consumer made the profit, he should have the benefit. Before dispersing, a hearty vote of thanks was accorded to the Chairman and Committee for their hospitality.

Under the title of Harrison Water-Works Appliances, Limited, a Company has been registered with a capital of £12,000, in £1 shares, to adopt an agreement with Mr. C. W. Harrison, and to carry on the business of water-works and water supply engineers, smiths, machinists, mechanical engineers, &c. There will be no initial public issue.

LOCAL GOVERNMENT BOARD AND SUCTION GAS PLANTS.

With regard to the attitude of the Local Government Board towards suction gas-producer plants, which was referred to in the last volume of the "JOURNAL" (pp. 909, 977), the "Middlesex Advertiser" makes the following statement: "The controversy in regard to the merits of suction gas plant in connection with the Uxbridge Water-Works does not abate. Indeed, there appears every prospect of the question being raised in a forcible way; for we understand that a petition has been, or is being, prepared to be presented to the Local Government Board, asking for the question of suction gas plant to be considered. It will be remembered that at the inquiry the Inspector expressed the opinion that the central authority would not sanction a loan for the installation of the plant in question, as it was considered to be in an experimental stage. This does not seem to be quite correct, inasmuch as it is reported that the Local Government Board appear to have sanctioned a loan for the purpose to other urban councils. It may be, of course, that different conditions existed in regard to the latter than prevail at Uxbridge. If not, it is difficult to understand the Inspector's remarks in regard to suction gas plant. Although adhering to the view previously expressed, that steam is the best motive power for the Uxbridge Water-Works, we think that it would be only fair to the advocates of suction gas plant if some explanation could be furnished by the Inspector of his statements in regard thereto at the inquiry."

GAS AND WATER PROFITS AT CARLISLE.

At the Meeting of the Carlisle City Council last Tuesday, some particulars were given as to the working of the Gas and Water Departments during the past year.

In moving the adoption of the Gas and Water Committee's minutes, Mr. Coulthard said they had heard a good deal of late about municipal trading; but so far as Carlisle was concerned, they had no reason to regret it in connection with the working of the gas and water concerns. For the last fifty years the profits from gas and water had been such as to assist considerably in carrying out great sanitary and other reforms which had placed Carlisle in the front rank as one of the cleanest and most up-to-date cities in the kingdom. The result of last year's working of the gas undertaking was a record one. The net figures were £7613, as against £6968 the year before, or £645 over the previous year, which was equal to nearly 1d. in the pound on the district rate. This was very good, when they looked round and saw what other municipalities were doing. Leeds, which was among the coalfields, showed a loss last year of £8592, as compared with the previous year; and Bradford had a loss of £1821. He could mention other towns in the same position. These losses were mainly due to the fall in the price of residuals. In Carlisle they had lost £2100 on account of the reduction in the price of coke, tar, and sulphate of ammonia. On the other hand, by the judicious selection of the best coal for gas-making purposes and the purchase of oil "in the nick of time," they had saved £2400. To show that the coal was a good selection, he might say that they had saved £500 in purifying material. He gave the whole of this credit to Mr. Smith, their Manager. The rental account, to him, was not very satisfactory; but this was no fault of the Committee or the Manager. The increase (£105) was the lowest that they had had during the 23 years he had been connected with the Gas Committee. In looking to find the cause of this, he attributed it to the loss of large consumers, who had taken on the electric light, and also to the use of the incandescent burner. The increase in the number of consumers was shown by the Manager's report to be 122 ordinary and 232 prepayment; but even this increase had not been able to balance the loss of the larger consumers. Cookers or stoves had increased to the extent of 276; and had they not had this addition, no doubt the consumption would have been considerably less. It would appear that Carlisle was not large enough to run both a gas and an electric supply, as one or both must suffer—especially if the charge made for electric light was not sufficient to meet the expenditure, which he understood was the case in the city during the past year. He hoped, however, that in another year the electric light would show better results, as it would be most unfair to tax those who did not use it to make up for the loss of those who did. As to next year, if the bye-products would only go up, or even if they went no lower in price, he thought he might predict that there would be a still larger balance. With regard to water, they had again made a substantial profit; but some £600 had had to be handed over for repairs of the baths, or the balance would have been larger. If by this time next year they got the water from the Gelt springs, and the quantity was sufficient to supply the city for the time being, they would immediately save £1000 per annum, which would go a long way to help to pay the principal and interest on No. 1 contract, about to be completed. With two such concerns as the gas and water undertakings at the back of the Corporation, they ought not to shirk the responsibility of completing one of the best schemes they had ever attempted to carry out for the benefit of the city.

In seconding the motion, Mr. Hurst remarked that the gas accounts again showed a very satisfactory result for the year's working. The demand for gas during the twelve months had not been so good as in the previous year; the quantity of coal gas made being 246 million feet as compared with 262 million feet—a falling off of a little over 6 per cent. The water-gas made had, however, risen from 79 millions to 87 millions, and now formed rather more than 26 per cent. of the total make. Mr. Nicholson asked how the Finance Committee were going to pay over profits amounting to £5636 in respect of the Water Department when there was only cash amounting to £1662 standing to the Treasurer's credit. Mr. Coulthard replied that as far as the Gas Committee were concerned he did not think there would be any difficulty. The whole of the money would be handed over to the Finance Committee; and Mr. Nicholson was a member of that Committee and would be able to arrange it. Mr. Nicholson said he declined to have anything to do with the transaction. He did not know how they were to pay

£5636 out of £1600. Mr. Coulthard answered that he had no suggestion to make.

The motion for the confirmation of the minutes was then put to the meeting and carried.

THE PRICE OF GAS AT ROCHDALE.

Reduction for Power Purposes.

At their last Monthly Meeting, the Rochdale Town Council discussed at great length a proposal of the Gas Committee that the charge for gas used for lighting should be reduced from 2s. 10d. to 2s. 7d. per 1000 cubic feet if consumed through ordinary meters, and that the net prices for other purposes should be as follows: "Under 10,000 cubic feet per quarter, 2s. per 1000 feet; over 10,000 and under 100,000 feet, 1s. 9d.; and over 100,000 feet, 1s. 6d." The charges proposed for gas used for power purposes were in place of the existing uniform rate of 2s. per 1000 cubic feet.

In moving the adoption of these recommendations, Mr. Walker said he did so in the interests of the gas undertaking, and from a business and commercial point of view. In some minds, no doubt, there was another reason why the price should be reduced—because it was unfair to the consumers of gas that they should aid the reduction of the rates, and relieve the non-consumers. Others might desire no reduction of the price at all; believing that the gas profits should go to the relief of rates, particularly when times were bad and rates were high. He pointed out that it did not follow that correspondingly high profits resulted from high prices. The Corporation had a monopoly in their gas undertaking; but they were not free from all competition, and it was to meet competition and to increase the output that the reductions in price were proposed. In his opinion, they were very moderate reductions. The gross profit on the gas-works for the year ending March 31 last was £30,900; and the average gross profit for the last ten years had been £28,356, or 12½ per cent. on the present mortgage debt of £225,256. The cost of gas made in 1904-5 was 1s. 7½d. per 1000 cubic feet; and the net profit per 1000 cubic feet was 9⅜d. The total amount handed over in aid of rates to March 31 was £396,556. These figures alone, in his opinion, amply justified the Committee in recommending the reductions now proposed; but figures did not constitute the main reason, which was that they would be able to meet competition already at their doors. They ought to meet this competition; and, what was more, they could afford to do so. The consumption of gas for lighting purposes was either at a standstill or declining—it was certainly not increasing; and he thought this was due to the high prices charged. Consumption for purposes other than lighting was increasing; the advance last year over 1899 being above 58 per cent. They believed the proposed reductions would have the desired result of increasing the general consumption.

The resolution was seconded by Mr. Sharp, who remarked that he had been an advocate of reduced prices for many years on the broad principle that it was unfair that those persons who used gas should have to pay at the rate of about 1s. 2⅜d. in the pound for those who were not consumers. One mill, which was rated at £2319 last year, used £36 worth of gas, and received in relief of rates from the gas profits £134. In the same way, another mill, which paid £32 for gas, had back £115 from the gas profits in relief of the rates. While these mills received so much relief from the gas profits, another firm which he named, who did not use electric light, paid £396 for gas and received only £69 relief from the profits. Personally, he was in favour of reducing the charge for lighting purposes to 2s. per 1000 cubic feet; and then they would make a considerable profit. But they must have a substantial sum in hand for contingencies. There was a new method of producing gas, which might be adopted by mills; and unless the Corporation reduced their charges, they were likely to lose customers. As to penny-in-the-slot consumers, he fought for their interests in Committee; but it was explained that at the time of the previous re-arrangement they had granted to them reductions which worked out at 10d. per 1000 cubic feet. This was very substantial relief; and in view of the fact that it cost a good deal to go round to attend to all these slot meters, he considered the Committee were justified on the present occasion in abstaining from an alteration of the charges to that class of customers.

Alderman Turner said that in Committee he voted for a reduction of 3d. per 1000 cubic feet in the price of gas used for lighting purposes; but since then circumstances had arisen which had caused him to change his mind, and he did not now think the time was opportune for a reduction. The Paving and Sewering Committee were called upon by the Mersey and Irwell Joint Committee to deal with the nuisance arising from the Sudden Brook at Buersil, and also with the sewage from the Moss Street district. These places had not up to the present time been connected to the town's main sewerage system; but the question was now being pressed upon the Committee in such a way that they were bound to deal with it; and they would have to do so to some extent during the present year. It was a serious matter. They could not tell exactly what the cost would be; but he thought he would be near the mark when he said the work would mean an expenditure of £8000 or £10,000. A considerable portion of this would have to be paid out of revenue; and no arrangements were made in the year's estimates to cover the cost, as the work was not then anticipated. With this expense before them, he thought it would be very imprudent on the part of the Council to make a reduction in the price of gas, except for power purposes. He admitted that certain anomalies existed; and there were some that the firm with which he was associated protested against very strongly. But he was prepared to sacrifice any gain in the matter for another year, in order to help the Corporation out of their difficulty. He was not proposing that any profits which might accrue from the gas-works should be devoted to the particular purpose of paying for the work which the Paving and Sewering Committee were now called on to do; but it was evident that if there was no profit from the Gas Department, the cost of those works would have to be rated for. He moved an amendment that the minutes be passed except so far as they related to the proposed reduction in the price of gas used for lighting purposes.

In the course of the discussion which followed the seconding of the amendment, Mr. Smith warned the members that 1d. per 1000 cubic feet off the price of gas meant 1d. extra on the rates next May. It's this, Mr. Redfern retorted, that Mr. Smith was a great advocate of reduced tram fares as a means of increasing the traffic; and he should apply the same principle to the price of gas. The lower the price, the more likely was the consumption to increase. Alderman Cunliffe hoped the Council would pause before reducing the price of gas at a time when the Corporation had many large and expensive undertakings in hand. Mr. Sharp talked about the Gas Committee making so much money. The Health Committee had spent a great deal which had to be found by the ratepayers; but they had done it in the interests of the town. He remembered the time when £18,000 had to be rated for on the water-works' account; and this year they were rating for a deficiency of £8000 on the trams. But nobody anticipated any such deficiency another year. Mr. Sharp: It will be nearer £10,000 than £8000. Alderman Cunliffe argued that it would be bad policy to reduce the price of gas now, and urged that if a reduction was made it would mean an increase of the rates. People looking out for sites for new industries were anxious to know the rates paid in districts suitable for them; but they did not bother themselves much about the price of gas. Mr. Bromley said he regretted that the amendment had been sprung on the Council. He was inclined to think that the expenditure talked of by Alderman Turner might stand over for a time. The proposed reductions in the price of gas did not go far enough for him. On the basis of present consumption those reductions meant a loss of revenue of £5712; but even then £14,000 was left, which was sufficient profit for any one department. He held that the gas-works' profit was largely made by shopkeepers and cottage owners; it was not being made by mills and workshops. Last year £1480 was paid as income-tax on gas profits. Let some of this be saved by making the reduction proposed. Other speakers approved of the principle of making a reduction, but thought the time inopportune.

It was pointed out by Mr. Ogden that the proposed concessions would not affect the amount of profits available for the relief of rates this year. Apart from that, should one department be called upon to provide for the exceptional needs of other departments? It was not an uncommon thing to spread such exceptional expenditure over several years. Let them, he said, remember also that a reduction of price would probably mean increased consumption; and, if it did, the loss due to the lowering of charges would be less than was estimated. A man who asked only about rates saw only with one eye; the price of gas was an important consideration. They should remember that the Committee's recommendations were made in the interests of the department. Mr. Jones remarked that it was said a reduction in price would increase consumption; but the last reduction of 4d. had not done so by a single cubic foot. The reduction now proposed would not benefit the occupiers of cottages. The average consumption of gas in cottages rented at £12 and rated at £9 was about 6000 cubic feet. A reduction of 3d. per 1000 cubic feet on this consumption would mean a saving on the gas bill of 1s. 6d.; but the consequent increase in the rates of 3d. in the pound would make the same occupier pay 2s. 3d. more. A week ago he was in favour of a reduction of 2d. per 1000 cubic feet for lighting purposes; but in present circumstances he would support no reduction. Mr. Sharp pointed out that there had been a large increase in the consumption of gas since the price was last reduced, though he could not prove, of course, how much was due to use for lighting and how much for power. In reply to a question, Mr. Walker said he was of opinion that, if the undertaking was in the hands of a company, a reduction of charges would take place.

The amendment, on being put to the vote, was carried; but a further amendment that the whole question of a reduction in prices be referred back to the Committee was lost. The curtailed proposal of the Committee was then adopted; the result being that the price of gas used for purposes other than lighting is reduced by 3d. per 1000 cubic feet for consumers of between 10,000 and 100,000 cubic feet per quarter, and by 6d. for those of over 100,000 feet. There is no reduction for lighting.

WIGAN CORPORATION GAS SUPPLY.

The Engineer's Annual Report.

In previous issues of the "JOURNAL," reference has been made to the past year's financial progress of the gas undertaking of the Wigan Corporation. We have lately received the annual report of the Gas Engineer and Manager (Mr. Joseph Timmins), from which we take the following particulars.

At the beginning of the year there were on the register 12,081 consumers by ordinary, and 3259 by slot meters, and at the end 12,308 by ordinary and 4855 by slots; giving an increase by ordinary of 227, or 1·87 per cent., and by slot of 1596, or 48·97 per cent. The total increase in the number of consumers for the year was 1823, or 11·88 per cent. This is regarded as a very gratifying result. In connection with the consumption of gas through prepayment meters, Mr. Timmins remarks that during the year a large number of coins other than pennies—such as sixpences, shillings, florins, half-crowns, and even a few half-sovereigns—were deposited in the coin-boxes. The majority of these were claimed, and those which were not were returned to the consumers. It is admitted by them that the coin-boxes are, as Mr. Timmins reported last year, used as miniature savings banks, as evidenced by the fact that a considerable number of consumers requested the coin-meter inspectors, a few days before Easter, to open the boxes, and return to them the various coins named above. The inspectors, however, declined to comply with the request; the time for returning the money being when the boxes are cleared. The consumers nevertheless have every confidence in the integrity of the inspectors. The number of gas-cookers on the register at the beginning of the year was 1793; and at the end 1796—the small increase being attributed to bad trade. The

number of gas-engines on the register at the end of the year was 82; representing in the aggregate 420 nominal horse power.

The quantity of coal and cannel carbonized in 1903-4 was 37,402 tons; whereas in the year covered by the report it was 37,095 tons—a decrease of 307 tons, or 0·82 per cent. The quantity of gas made was 422,306,000 cubic feet; being a decrease of 3,013,000 cubic feet, or 0·70 per cent., on the preceding year. The quantity sold also fell off to the extent of 1,181,000 cubic feet, or 0·30 per cent. The consumption by slot meters, however, increased by 15,638,400 cubic feet, or 91 per cent. The cost of coal and cannel was 10s. 1¾d. per ton, against 10s. 8d. in the year 1903·4; but the revenue from residuals in the latter year was 10s. 10d. per ton, compared with 8s. 10¾d. in the twelve months lately closed. Taking the years from 1887 onwards, the average cost has been 9s. 10¼d., and the revenue 7s. 5¾d. The make of gas per ton was 11,384 cubic feet, of which 10,536 cubic feet were sold, or 92·55 per cent. of the make. The coke and breeze were 14·27 cwt. per ton; and 2·25 cwt. of coke, or 15·75 per cent. of the make, was used in manufacture. Of the other residuals, the make of tar was 13·12 gallons, and of liquor 38 21 gallons, per ton—the latter being worked up to 28·6 lbs. of sulphate per ton. The capital invested in the works is £365,707; being at the rate of £9 17s. 2d. per ton of coal, 17s. 3d. per 1000 cubic feet of gas made, and 18s. 8d. per 1000 cubic feet sold.

Mr. Timmins says the working costs for the year were rather below the average; and, except for the "slump" in the prices obtained for tar and coke, which must be considered only of a temporary character, and the very large increase of £2264 in the rates—the three combined having brought about a reduction in the revenue of £4791, to which must be added £4266, the value of gas supplied for public lighting—the amount of profit would have proved a record, notwithstanding a reduction in the price of gas of 2d. per 1000 cubic feet. He points out that the present prices for gas are the lowest that have been charged since the Corporation came into possession of the undertaking, and he believes since the works were erected. With regard to the decreased consumption, he says the general adoption of the incandescent gas-light militates against an increase, as where four flat-flame burners were in use there are now only two incandescents—resulting in 50 per cent. decrease in consumption, with 50 per cent. increase in illuminating power, and so on in proportion. He concludes by thanking the Chairman, Vice-Chairman, and the other members of the Committee for the support and encouragement he has at all times received from them; and he again bears testimony to the loyal co-operation of those of the staff who are associated with him in conducting the various operations of the gas undertaking.

RAMSGATE GAS AND WATER DEPARTMENTS.

The Ramsgate Gas and Water Committee recently had presented to them the report of Alderman Hart, the Chairman of the Gas and Water Accounts Committee, on the working of the two departments during the year to March 31.

With reference to the gas-works, the capital expenditure for the year amounted to £2346; the principal item being £1600, the proportion of the cost of a new retort-bench which the Committee decided should be charged to capital. The balance was for new services and meters. The receipts from the sale of gas, under all headings, were £12 less than the previous year; this result being attributed to the extended use of the incandescent system, the abnormal mildness of the winter, and the general slackness in trade. The hire of fittings and stoves, after allowing for depreciation, produced £1063. The receipts from coke were £413 less; and the income from tar was also smaller. The return from sulphate was good; being within £17 of the previous year, notwithstanding that a less quantity of coal was carbonized. The total production of sulphate was equal to 21·84 lbs. per ton of coal; while the entire proceeds from the sale of residuals amounted to 50 per cent. of the cost of coal. Taking the whole of the revenue, the net result was a decrease of £190. On the expenditure side, coal cost £494 less—due to a reduction in price and to a less quantity having been carbonized owing to improved working; the make per ton having increased from 11,304 to 11,423 feet. Repairs of works were £815 less; and the amount charged under this head included £1128 as the proportion to be added this year on account of the rebuilding of the retort-bench—£1000 having been charged against the previous year's revenue on this account. The total cost of this work was £5728; and the amounts already paid out of revenue and capital leave a sum of £2000, which it is proposed to spread over the next two years. The total expenditure was £222 less than in the previous year, leaving a gross profit of £9460, or an increase of £32—a result which, considering all the prevailing circumstances, is regarded as eminently satisfactory. After deduction of fixed charges, there is a net profit in hand of £1009. The gas made was 243,861,000 cubic feet, as against 243,431,000 cubic feet. Alderman Hart pointed out that, in addition to paying rates and taxes in the ordinary way, the Gas Department contributed substantially to the rates by having to pay over £2000 a year on account of harbour coal dues. This amounted to above 2d. per 1000 cubic feet of gas. He concluded by remarking that the Engineer, Mr. T. N. Ritson, had done everything that lay in his power for the success of the undertaking. The gross profit for the past year was the second largest they had had; and it would have been a record but for the sum of £1128 which had been charged to revenue on account of the new retort-bench. Moreover, coal had cost £2000 more than in the record year—1900.

Owing to the large number of empty houses in the borough, the receipts from the sale of water were £63 less; but various small increases in other items reduced the deficiency to £30, the total income being £11,882. On the expenditure side, the only amount that was at all out of the ordinary was a charge of £400 on account of the relaying of mains. The gross profit was £6058, as against £6474; and after providing for loan charges—£6056, an increase of £83—there remained a net surplus of £2 8s. 7d. This was equivalent to placing the whole of the year's profit towards the suspense account for relaying mains.

TIPTON GAS SUPPLY.

The manufacturing statement of Mr. Sidney O. Stephenson, the Gas Engineer and Manager to the Tipton Urban District Council, shows that during the twelve months to March 31 last, 10,948 tons of coal were carbonized, as against 10,590 tons in the preceding year. The total gas made was 129,179,000 cubic feet, or 11,799 feet per ton, compared with 132,323,000 cubic feet, or 12,494 feet per ton. Last year 4,754,000 cubic feet of water gas, or 3·68 per cent. of the total make, was added, as against 10,503,000 cubic feet, or 7·94 per cent. of the total make, in 1903-4. The net make of coal gas per ton was therefore 11,365 cubic feet last year, compared with 11,502 feet. Leakage, condensation, &c., shows a substantial reduction; the figures being 15·31 per cent., compared with 19·02 per cent. The net receipts for gas were £14,768, against £14,532; and for residual products £4465, against £4456. The total receipts were £19,444, compared with £19,184. On the expenditure side, the only item to show an increase is that of rent, rates, taxes, and insurance. Manufacture cost £9899, against £10,217; and distribution £718, against £771. The result was a gross profit of £6884, as compared with £6160 for 1903-4. After payment of interest and sinking fund charges, there is a net surplus (carried to accumulated profits account) of £2078.

BURTON-ON-TRENT GAS SUPPLY.

Reduction in the Price of Gas for Heating Purposes.

At the last Meeting of the Burton-on-Trent Town Council, the Chairman of the Gas and Electricity Committee (Alderman Lowe) brought forward, in accordance with notice, a motion to reduce the price of gas to consumers using more than 250,000 cubic feet per quarter to 2s. 4d. per 1000 cubic feet, provided the supply is through a separate meter. He reminded the Council that the charge for gas used in engines was 2s. 4d. per 1000 cubic feet. There were a few consumers who burnt a large quantity of gas for heating purposes, and the Committee felt that it was only fair that these should be put upon the same footing as those who had gas at a reduced rate for engine purposes. The Committee thought the arrangement they proposed was a fair and equitable one. The customers referred to were good ones, and their case ought to be considered. Mr. King seconded the motion. Mr. Hutchinson said he was in favour of a reduction in price all round. The present concession was but as a drop in the ocean. Alderman Lowe said the reduction included all consumers of 250,000 cubic feet per quarter (who now pay 2s. 8d. per 1000 cubic feet). There were not many of them; but, few or many, they should be dealt with justly, and be treated as other large consumers. The price of gas was again referred to when Alderman Lowe moved the adoption of the report of the Gas and Electricity Committee, and stated that the coal tenders had been concluded on extremely favourable terms. The prices were about 8d. per ton lower than they were a year ago, and there would be a saving of something like £1200 or £1300. Mr. Stack congratulated Alderman Lowe upon his success in buying the coal required, and on the general management of the works under the direction of the Committee. He wished to bring to his notice the case of the penny-in-the-slot customers, who paid in advance; and expressed the hope that he would see his way to giving them some advantage as soon as possible. Mr. Harlow remarked that when the price of gas went up, they were told it was due to the increase in the cost of coal. Now, seeing the low price at which coal could be secured, he thought the Committee might take into consideration the advisability of reducing the charge for gas. Alderman Parker said the argument in favour of a reduction in the price of gas never appealed very strongly to him, because they had to raise the money somehow. He did not know a better or a fairer way than keeping the price of gas at a reasonable figure. Alderman Lowe, in reply, pointed out that the price of coke and other residuals had decreased, so that the sum of £1300 he had mentioned was not all profit. He hoped the time would come when he would be in a position to reduce considerably the price of gas without the profits being less than they were at present. With regard to the penny-in-the-slot customers, it was a mistake to think that, because they paid the most, they were the most profitable. As a matter of fact, they were the least paying customers, because the putting in of fittings and the cost of collection more than counterbalanced the increased price charged for the gas. He could not, therefore, hold out at present any hope of a reduction to these customers. The motion was then agreed to.

Pontefract Gas Purchase Question.—A special meeting of the Pontefract Town Council has been held to consider the report of a Sub-Committee appointed to confer with the Directors of the Gas Company as to the terms upon which the undertaking could be purchased by the Corporation. The Sub-Committee suggested that the price should be ascertained by arbitration, at which each side should be represented by one Counsel and two expert witnesses only; and they stated that the Directors had promised to lay this proposal before their shareholders when it had received the sanction of the Council. After discussion in Committee, the action of the Sub-Committee was approved.

Reductions in Price.—The Leek Urban District Council have agreed to a recommendation of the Gas Committee that the price of gas be reduced to ordinary consumers from 2s. 11d. to 2s. 9d. per 1000 cubic feet, subject to the usual discount of 6d. for prompt payment; also that prepayment consumers be allowed a further discount of 3d. per 1000 cubic feet—the usual discount to be allowed in the case of gas-engines. In response to a request from the Brighouse Chamber of Commerce, supported by one of the largest firms in the borough, for a reduction in the price of gas charged for trade consumption, the members of the Gas Committee of the Brighouse Corporation have held a meeting, and by a narrow majority have decided to recommend the Town Council to grant an all-round reduction of 3d. per 1000 cubic feet, making the price 2s. 8d., with 2d. discount if paid within two months.

GAS AND WATER AFFAIRS AT GOOLE.

The accounts of the Goole Gas and Water Works for the year to March last state that the total income from the gas undertaking was £11,625. This includes £7079 received from private consumers for 47¼ million cubic feet of gas; while the Council paid £1292 for public lighting, and various companies paid £408 for 2½ million cubic feet of gas. Residuals realized £2544. The cost of 6401 tons of coal (including cartage and porterage) was £2837, or only £293 more than the receipts from the residual products. The total expenditure was £4846, which left a profit on revenue account of £6778. The income from water was £3379; and as the outlay was only £806, there was a sum of £2573 to be transferred to profit and loss account. These two balances, along with £150 interest received, make the total income £9501. From this has to be deducted £1907, which includes £818 for rates and taxes, £670 for management, and £113 on behalf of the electric lighting scheme. An amount thus remains of £7594, out of which £6506 is to be devoted to repayment of principal and interest on loans, leaving an actual net profit on the year's working of £1088.

Along with the balance-sheet, a comprehensive report on the figures has been issued to the members by the Clerk to the Council (Mr. J. W. Johnson), in which comparisons are made between last year and the year preceding. In regard to the gas revenue, there is a decrease of £1251. The smaller consumption accounts for £416, a decrease in the price of gas of 2d. per 1000 cubic feet accounts for £343, and the reduced price of residuals for a further £447. There was a decreased expenditure, however, of £342; the principal item in which consisted of £328 less for coal. Altogether the amount transferred from the Gas Department to the profit and loss account showed a decrease of £909. In regard to the water-works, the increased revenue was £128, principally derived from additional water-rentals and street-flushing, while there was a decreased expenditure of £68—this department thus showing an increased transfer of £196. The total decrease in the actual net profits for the past year, as compared with the previous year, was £594, which, he remarks, in view of the decreased price of gas and other items mentioned, may be considered as very satisfactory.

In moving the adoption by the Council of the Gas and Water Committee's minutes—which contained the report above referred to, and an intimation that the Clerk had been instructed to obtain a loan of £1000 for extensions authorized by the Local Government Board—Mr. Blyth remarked that he was pleased to say the Gas and Water Department was in a satisfactory state, though he regretted that there had been a diminution of some 2½ million cubic feet in the consumption of gas. Against this, however, there had of late years been a very large decrease in the cost of manufacture, which had been reduced until now the net cost per 1000 cubic feet in the holders, including all manufacturing charges—*i.e.*, coal (less residuals), purification, wages, and maintenance—was only about 6½d. In regard to the water, they might congratulate themselves on the supply. While many towns had been suffering from drought, in Goole they had had cause to be thankful, because the supply had proved sufficient and of good quality. So far as the £113 which had been expended on the Electricity Department was concerned, this would be handed over from the general rate to the gas and water account, as it had been decided that this was to be a separate account. In conclusion, he paid a tribute to the efficient services of the Engineer and Manager (Mr. T. E. Franklin), and said that as they had renewed their contracts at satisfactory prices there was every reason to look forward to another good year. He also congratulated Mr. Johnson, as the head of the collecting department, and the whole of the staff, on the results obtained.

Mr. Turton, in seconding, said that though they had made less profit than in the previous year, this was explained by the decreased returns from residuals and the reduction in price. At the end of 1902 they were rather anxious about their financial position, because they had scarcely enough money to carry on the work without resorting to the loan for which they had obtained sanction. They got along without drawing on this loan, though at the end of 1902 there was only £481 in the bank. This year there was £3522 in the bank, which was very satisfactory, considering that during the year they had paid over £832 to the relief of rates.

The minutes were adopted.

GAS v. ELECTRICITY AT LOUTH.

Local Government Board Inquiry.

Last Tuesday, an inquiry was held at Louth, by Mr. H. Ross Hooper, M.Inst.C.E., in regard to an application by the Corporation for authority to raise money to carry out an electric lighting scheme. It was opposed by the local Gas Company, who were represented by Mr. Etherington Smith. Among the witnesses called by him were Mr. M. A. Adam (of Messrs. Dugald Clerk and Adam), who stated that the oil-engines proposed to be used would be useless for the purpose of generating electricity, and Mr. J. H. Troughton, the Engineer and Secretary of the Newmarket Gas Company, who showed that the proposal was unworkable and would prove unremunerative, and that incandescent gas lighting, with gas at 3s. 3d. per 1000 cubic feet (the local charge), was cheaper than any electric supply, and far preferable. The inquiry had not proceeded very far when the Inspector reduced the amount proposed to be spent from £17,000 to £14,000, as the applicants acknowledged that the lower figure would be sufficient to supply 4¼ miles of streets; and before the proceedings closed he said he was not satisfied that the Corporation would be able to give an improved light under the scheme. The local witnesses in support of the application were so reckless in their statements, that an opening was afforded for the officials of the Gas Company to give the Inspector some useful information. The Manager (Mr. J. A. Young) told him that the Company were in a position to meet twice the present demand for gas, which was supplied at more than 17-candle power, compared with the statutory 14 candles. The Secretary (Mr. P. Allison) showed that the Company had always been willing to discuss terms and methods of lighting with the Corporation; and that a proposal made by the Directors that a scheme and price should be determined by arbitration by independent experts had not been so much as acknowledged. It was put to the Inspector that the Corporation would require a good quantity of current for the public lighting; but he said he did not want to know what the Corporation would take, but what would be the general demand. As they had depended very much upon the supply of current for the public lamps, this remark was rather disconcerting. A Committee of independent ratepayers opposed to the scheme presented, through their Solicitor, a petition against the proposal, signed by 397 ratepayers, representing an assessment of £10,700.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 165.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p.c.	20⅜—21⅛	..	4 17 8
160,000	10	,,	7½	Do. 7 p.c.	14½—15½	+⅛	4 16 9
200,000	5	May 12	6½	Bombay, Ltd.. . . .	6½—7	..	4 12 10
140,000	5	,,	6½	Do. New, £4 paid	5—5½	..	4 14 6
50,000	10	Mch. 15	14	Bourne-) 10 p.c. . .	29½—30½	..	4 11 10
251,810	10	,,	7	mouth Gas) B 7 p.c. .	16½—17½	..	4 0 0
53,200	10	,,	6	and Water) Pref. 6 p.c.	15⅜—16½	..	3 12 9
380,000	Stk.	Feb. 24	12	Brentford Consolidated	248—253	..	4 14 10
300,000	,,	,,	9	Do. New . . .	188—193	..	4 13 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	127—132	..	3 15 9
206,250	,,	June 15	4	Do. 4 p.c. Deb. .	103—106*	..	3 15 6
220,000	Stk.	Mch. 15	11	Brighton & Hove Orig.	225—230	..	4 15 8
246,320	,,	,,	8	Do. A. Ord. Stk. .	165—170	..	4 14 2
460,000	20	Mch. 30	10	British	40—41	..	4 17 7
100,000	Stk.	Feb. 24	6	Bromley, Ord. 5 p.c. .	120—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—94	..	4 15 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
150,000	20	July 13	8½	Cagliari, Ltd.	24—26*	..	6 6 11
100,020	10	May 31	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Apl. 28	4½	Do. 4½ p.c Pref.. .	10—10½	..	4 5 9
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,400,000	Stk.	Feb. 24	5⅛	Commercial 4 p.c Stk. .	116—119	..	4 7 4
560,000	,,	,,	5	Do. 3½ p.c. do. .	112—115	..	4 6 11
450,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	85—87	..	3 9 0
800,000	Stk.	,,	6	Continental Union, Ltd.	105—110	+3	5 9 1
200,000	,,	,,	7	Do. 7 p c Pref.	137—142	..	4 18 7
424,070	Stk.	Feb. 18	5½	Derby Con. Stk. . . .	124—126	..	4 7 4
55,000	,,	June 3	4	Do. Deb. Stk. . . .	108—110	..	3 12 9
486,090	10	Jan. 27	11	European, Ltd. . . .	22—23	..	4 15 8
354,060	10	,,	11	Do. £7 10s. paid	15—16	..	5 3 2
15,243,200	Stk.	Feb. 10	4⅛	Gas-) 4 p.c. Ord. . .	99—100	+1	4 8 0
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	92—94	..	3 14 6
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	109—111	..	3 12 1
4,193 975	,,	June 15	3	Coke) 3 p.c. Con. Deb.	88—90	—1	3 6 8
258,740	Stk.	Mch. 15	5	Hastings & St. L. 3½ p.c.	100—103	..	4 17 1
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	17⅜—18½	..	5 18 11
3,800,000	Stk.	May 12	10	Imperial Continental .	210—213	..	4 13 11
473,600	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Mch. 15	6	Lea Bridge Ord. 5 p.c. .	120—125	..	4 16 0
561,000	Stk.	Feb. 24	10	Liverpool United A . .	224—226	..	4 8 6
718,100	,,	,,	7	Do. do. B .	166—168	..	4 3 4
306,083	Stk.	June 29	4	L'rpool Unit'd Deb. Stk.	111—113	+2	3 10 10
75,000	5	,,	5	Malta & Medn., Ltd. .	4—4½	..	5 11 1
560,000	100	Apl. 1	5	Met. of) 5 p.c. Deb..	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 31	3½	Monte Video, Ltd. . .	11—12	..	5 16 8
1,565,892	Stk.	Feb. 24	4½	Newc'tle & G'tesh'd Con.	108—109	..	4 4 10
406,625	Stk.	June 29	3½	Do. 3½ p.c. Deb.	92—93	..	3 15 3
15,000	10	Feb. 24	10	North Middlesex 10 p.c.	19—20	..	5 0 0
52,940	1	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	145—148	..	5 8 1
600,000	5	Mch. 30	7	Ottoman, Ltd. . .	6—6⅛	..	5 12 0
168,255	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord. . . .	5⅝—6	..	5 0 0
796,980	5	Jan. 27	5	Do. 5 p.c. Pref. .	5½—5⅝	+⅛	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
851,070	10	Apl. 28	7	River Plate Ord. . . .	11¾—12¼	..	5 14 3
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
250,000	10	Apl. 13	7	San Paulo, Ltd. . . .	12⅞—13¼	..	5 5 8
70,000	50	July 1	5	Do. 5 p.c. Deb. .	51—53	..	4 14 4
135,000	Stk.	Mar. 15	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	236—238	..	4 4 0
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Mch. 30	5	Shrewsbury Ord. 5 p.c.	107—110	..	4 10 11
70,000	10	May 31	10	South African	15⅜—16⅛	..	6 1 3
6,250,000	Stk.	Feb. 10	5⅛	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,832,700	,,	July 13	3	Do. 3 p.c. Deb.	89—91*	+⅛	3 5 11
575,000	Stk.	Feb. 24	5⅛	S'th Suburb'n Ord. 5 p.c.	121—124	..	4 8 9
60,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
112,533	,,	July 13	5	Do. 5 p.c. Deb. Stk.	127—132*	—½	3 15 9
502,310	Stk.	May 12	5	Southampton Ord. . .	107—110	..	4 10 11
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Feb. 24	6¼	Tottenham) A 5 p.c. .	125—128	..	4 17 8
338,020	,,	,,	4¼	and) B 3½ p.c. .	98—101	..	4 14 1
125,000	,,	June 23	4	Edmonton) 4 p.c. Deb.	105—108	..	3 14 1
182,380	10	June 15	8	Tuscan, Ltd.	9½—10	..	8 0 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
30,000	Stk.	Feb. 24	7⅞	Wands-) A 5 p.c. . .	163—168	..	4 12 3
255,636	,,	,,	6¼	worth) B 3½ p.c. . .	135—140	..	4 9 3
60,000	,,	,,	5⅛	and) C 3½ p.c. . .	114—116	..	4 13 6
57,564	,,	June 29	3	Putney) 3 p.c. Deb. Stk.	80—85	..	3 10 7
745,872	,,	Mch. 15	5	West Ham 5 p.c. Ord. .	102—104	..	4 16 2
185,000	,,	,,	5	Do. 5 p.c. Pref. .	123—126	..	3 19 4
193,300	,,	June 29	4	Do. 4 p.c. Deb. Stk.	104—109	..	3 13 5

Prices marked * are "Ex div."

WATER SUPPLY IN SUSSEX.

The New Works at Robertsbridge.

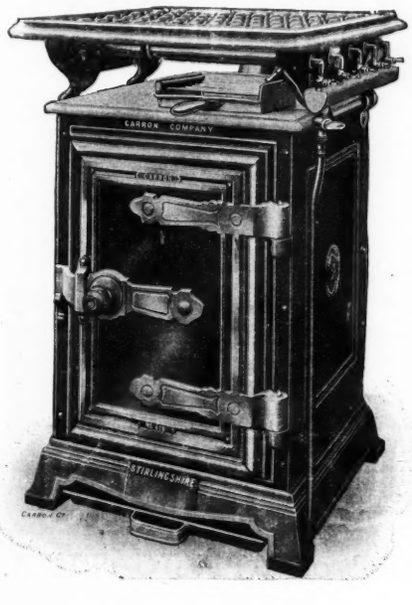
Last Tuesday the village of Robertsbridge, which is situated in Sussex, some twelve miles from Hastings, was *en fête;* the occasion being the turning on of a water supply which has just been provided for the district by the Robertsbridge, Salehurst, and Hurst Green Water and Gas Company, Limited. The intention is to take the water in bulk (under a concession) from the Ticehurst and District Water and Gas Company; and about 6 miles of mains have already been laid. The ceremony was performed at a stand-pipe by Lady Osborne, with a silver key presented to her for the purpose. Afterwards lunch was served to a large number of guests in a marquee which had been erected upon the ground; the chair being taken by Mr. E. Eaton, the Chairman of the Company.

The loyal toast having been honoured, Sir Francis Osborne, Bart., J.P., proposed "Success to the Robertsbridge, Salehurst, and Hurst Green Water and Gas Company." In doing so, he remarked that it was only those who lived in the country who could fully appreciate the value of good water and a plentiful supply. How many people were there who stopped to think what it meant to have a house or estate without any water? It was such an essential part of their existence, that without it life and property could not be maintained. A few summers back, there were many places in Sussex where wells ran short which had never before been known to fail; and in this particular district he believed they were very seriously below the normal level—so much so that all building operations at Robertsbridge had been entirely checked. But now this had all been changed; and in his opinion the inhabitants were to be congratulated on having, right at their very doors, a Company who were offering them a good supply of water, and so relieving them of anxiety as to what their own wells could do. The Directors, he understood, had been very particular in guarding against any possible failures in the future. They had secured the freehold of a piece of land; and on this piece of land there was a well which would afford an ample supply for the inhabitants of Robertsbridge in the case of failure by the Ticehurst and District Water and Gas Company, who, as those present probably knew, would supply the place for the present. In addition to this, the Directors had had the foresight and prudence to secure a piece of land upon which a reservoir would be built, so as to augment the well which he had just referred to, but which he hoped they would never require. The area over which the Company would supply water covered some 30 square miles, comprising the parishes of Robertsbridge, Etchingham, Salehurst, and Hurst Green. There were several country seats and large houses in this district; and he might tell them that important contracts had been entered into for the supply of water. The Company would, however, not only benefit the neighbourhood by providing a good and ample supply of water for domestic and trade purposes, but they would considerably add to the general safety of the whole district by the use of the water in case of fire. This was a matter the importance of which was every day being brought to their minds, particularly in the country, because when there was a fire it generally resulted in the property being burnt down and lost. The source from which the water would be obtained was, as he had mentioned, the Ticehurst Company. It came from a well at Crowhurst, 8 ft. 6 in. in diameter and 63 feet deep, which was lined with brickwork to keep out surface water. The sinking was commenced in May, 1903, and completed in September, when a twenty days' continuous pumping test was carried out. During this trial, an average of 287 thousand gallons were pumped from the well each day, or equal to nearly 6 million gallons for the twenty days. The formation passed through in the sinking of the well included about 30 feet of clay and shale, which was a good protection against the percolation of surface water. The bottom of the well was entirely in the sandstone rock, from which practically all the water was drawn. The water was pumped from the well by the Ticehurst Company into a reservoir situated on Burwash Common, which had a capacity of 50,000 gallons, and the top water level of which was 572 feet above sea-level. The reservoir was built of concrete, and provision had been made for duplicating its storage capacity when required. The machinery of the Ticehurst Company was duplicated, so that a breakdown would not jeopardize the supply. The arrangement was that the Ticehurst Company would deliver the water to the Robertsbridge Company in bulk through meters; and the latter Company would distribute it throughout the district he had named. The laying of the mains from Burwash to Robertsbridge had been entrusted to the Gas and Water Works Supplies and Construction Company, Limited; and the work had been carried out under the direction of Mr. G. H. Perryn, Mr. Eaton, and the Managing-Director of the Robertsbridge Company (Mr. A. W. Lunt).

Mr. Lunt, whose name was coupled with the toast, replied; and numerous other speeches of a felicitous character were delivered before the proceedings terminated.

Unsatisfactory Water Supply at Aberavon.—The Water Committee of the Aberavon Town Council have received a letter from the Board of Trade stating that Major Norton, who recently held an inquiry in the town, had ascertained that the water supply was in a very unsatisfactory condition, notwithstanding the supplementary supply from Margam. It was suggested that some steps should be taken, and that a qualified engineer of large experience should be called in to report upon a feasible and comprehensive scheme. The Committee resolved that the Town Clerk should write to the Clerk of the Glamorgan County Council asking for further particulars as to a suggestion that had been made with regard to the promotion of a Bill to safeguard the Welsh sources of water supply and prevent their appropriation by outside authorities.

CARRON



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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Gas-works affairs bulked largely at the meeting of the Arbroath Town Council on Monday. The Gas-Works Committee reported that they had considered the application by Mr. Mackintosh, the Town Chamberlain, for increased remuneration, which he asked on account of the extra work devolving upon him on account of the receipt of revenue from the residual products works at the gas-works. The application was supported by the Gas Manager—Mr. A. C. Young—and by the Auditor of the burgh accounts. The Committee recommended that an increase of £30 in his salary be granted. They also, without application having been made, recommended that the Gas Manager receive an addition of £50 to his salary. The Council ultimately, by eleven votes to six, approved of the increase. The extra remuneration to the Town Chamberlain was agreed to by 12 votes to 5. The Council then considered the proposals with reference to the supply of gas-cookers, which have been already given, and adopted them. It was stated that the estimates, which are in preparation, will admit of the reduction in the price of gas to ordinary consumers from 3s. 1½d. to 2s. 11d. per 1000 cubic feet.

The Edinburgh and Leith Gas Commissioners have to-day reclaimed to the First Division of the Court of Session against the decision of Lord Ardwall in the action by Messrs. J. Muir and Son, Limited, of Edinburgh, against the Commissioners, with reference to the alleged pollution of a well in their Calton Hill Brewery. As mentioned in my "Notes" a fortnight ago, Lord Ardwall gave decree for £3730 as damages, and awarded expenses to the pursuers. As the Long Vacation begins next week, the case cannot now be heard till October or November.

The annual meeting of the Stirling Gaslight Company was held on Tuesday. The Directors' report, which was submitted, showed that the profit for the year, after providing for the payment of renewals and the extension of the works, and also for payment of the proportion of costs of the Provisional Order, amounted to £3698. Including £2547 brought forward from last year, there was a sum of £5178 at the credit of the profit and loss account. The Directors recommended payment of a dividend at the rate of 9s. 5½d. per share on the old stock of the Company, and of 4s. 7d. per share on the new stock (for five months, equal to 11s. per share), amounting together to £3737; also that a further sum of £600 be added to the insurance fund, raising it to £1632; and that the balance of £1027 be carried forward. The Chairman said that the Directors were gratified that the Company were still progressing. The new purifiers and sulphate of ammonia plant were completed, and were working satisfactorily. There had been 182 new consumers during the year; and 91 additional cookers and 288 grillers had been fitted. The increase in the manufacture of gas was nearly 3½ million cubic feet. Since May 15 last, when the price was reduced from 2s. 10d. to 2s. 8d. per 1000 cubic feet, applications had been received for 300 additional cookers, and 900,000 cubic feet of gas had been made over the quantity in the corresponding period of last year. The report was adopted, and the dividends were declared.

In the Broughty Ferry Town Council on Monday, Mr. C. T. Godfrey submitted the accounts of the Corporation for the past year. Upon the gas accounts, he said that, owing to the unwearied attention and careful management of Mr. Crystal, the Convener, and of Mr. Keillor, the Manager, they showed a surplus on the year's working of £1345. This he thought was most satisfactory; and the Council and the public were indebted to the Convener and the Manager for the result. The debit on the gas account was now £2387; but to this, unfortunately, they were compelled by the Scotch Office to add the total deficiency on the Electricity Department, which amounted to £1061, and which brought the apparent deficiency on the Gas Department up to £3448. In the Electricity Department the receipts were £1310; while the estimate was £1408. He was sorry they had gone back in that department. The accounts were adopted. Mr. Godfrey then submitted the estimates for the current year. They did not anticipate that they would turn out anything but favourable. In the Gas Department they estimated for a very small increase in the sale of gas, though they did not anticipate so favourable a year as last, and could not count on being so successful. They reckoned to pay the first instalment of the cost of the extensions, amounting to £256, and to have a surplus of £640. He moved that the price of gas be retained at 3s. 6d. per 1000 cubic feet, with 2½ per cent. discount, and at 3s. 11d. to outside consumers; and that the charge for gas for the public lamps be 19s. each. The estimates were adopted.

The annual meeting of the Cupar Gas Company was held on Thursday last. The Directors reported that the amount of profit for the year was £941, which, with £188 brought forward, made a sum of £1129. They proposed to pay a dividend of 5 per cent., less income-tax, on the preference shares, which would absorb £225, and a dividend of 35s. per share, less income-tax, on the ordinary shares, which would require £438; also to allow £300 for depreciation, and to carry forward £137. They also recommended that the price of gas be continued at 3s. 11½d. per 1000 cubic feet. The average income per prepayment meter was £1 11s. 7d.—an increase of 3s. 3d. per meter. They had 330 such meters in use—an increase of 35. Of gas-cookers they had over 250 in use—the increase during the year having been between 60 and 70. The report was adopted. The Duns Gaslight Company have paid a dividend at the rate of 6⅝ per cent., equal to 8s. upon each accumulated share of £6 5s., and have carried £150 to the reserve fund. The report of the Directors of the Bridge of Weir Gas Company showed that from 1003 tons of coal 8,994,600 cubic feet of gas had been produced, of an illuminating power of 25 candles. There are 50 gas cooking-stoves on hire. The price of gas has been reduced from 4s. 7d. to 4s. 4½d. per 1000 cubic feet, less 10 per cent., for gas used for cooking purposes. A dividend at the rate of 1s. 6d. per share—the same as last year—was declared.

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NEW EDITION of VALVE CATALOGUE SENT on APPLICATION.

The Grangemouth Town Council this week approved of the report of a Committee which they had appointed to conduct negotiations for the transfer of the undertaking of the Gas Company, and remitted to the Committee with power to employ a man of skill to assist them in deciding whether or not they should proceed with the transfer.

The Denny Town Council have agreed to reduce the illuminating power of the gas they supply from 25 to 20 candles. Provost Hunter, in the course of his remarks, said the Gas Committee were considering whether they could do anything in the way of supplying incandescent gas burners free. This matter was not yet mature; but the reduction of the candle power was a step in that direction. Eventually it was agreed to defer consideration of this subject, and also of a proposal for the introduction of enrichment of the gas by benzol.

At the Hamilton Town Council meeting this week, the report of the Gas Manager—Mr. J. Ballantyne—was submitted. In it he stated that there had been an increased make of gas during the past year amounting to 38,500 cubic feet, and an increased sale amounting to 647,460 cubic feet. The leakage was 11·17 per cent., as compared with 12·19 per cent. There was a gross profit on the working of the sulphate plant of £1857. The yield of sulphate per ton of coal was 35 lbs. The gas accounts for the year showed a gross profit of £4098, which was an increase of £325 upon the estimate. The net profit for the twelve months was £1823. The Gas Committee recommended that this amount be carried forward. The Committee agreed that a sum of £3073, the unapplied balance at the credit of the sinking fund, be applied to the reduction of loans, and that the balance due to the bank for capital expenditure be liquidated by new loans. After discussion, these proposals were agreed to.

The annual meeting of the Hawick Gaslight Company was held last week—Mr. Robert Noble, of Borthwickbrae, presiding. The Chairman said that the shareholders had every reason to be satisfied with the result of the twelve months working, and at being able to keep the record price of gas for another year at 2s. 8½d. per 1000 cubic feet.

A state of matters which is really alarming has been disclosed this week with reference to the water supply of the Edinburgh district. Since August last, the weather has been so exceptionally dry that the reservoirs never perceptibly filled. Now they are lower than they have been at any time during the past ten years; and in this time the population has increased by 70,000. The quantity of water in store at the present time is 1,406,090,000 gallons. The consumption is at the rate of 18 million gallons per day; so that, provided the drought continues, in about 80 days' time the last drop of water will have been used up. The new reservoir at Talla is filling slowly; the stream being so low that almost all of it is required for compensation water.

At a meeting of the shareholders in the New Hygienic Stove Company, Limited, of Huddersfield, last Thursday, the Directors reported a very satisfactory state of affairs; and a dividend of 7½ per cent. on the share capital was declared, payable on the 1st prox.

CURRENT SALES OF GAS PRODUCTS.

Week ending July 15.

Very considerable business has been done in London pitch during the last ten days; and the price has been well maintained—the best informed buyers hardly daring to hope for a further decline. The reduction in prices by a few pence is sufficient to bring in large orders. This appears to be mainly due to the very strong Continental buying. It is thought that country distillers might well become firmer. So far as is known, London makers do not quote below 29s. 6d. net Thames for any delivery. The best quality of anthracene, owing to the fact that London makers hardly produce the article now, is steady at 2d. per unit 40-45 per cent.; 90 per cent. benzol is in good demand at 9½d. net, casks free; 60° crude carbolic is steady at 1s. 9d. to 1s. 9½d. net; also crystals at 6d. for 35°, and 6½d. for 39-40°. London creosote of good quality is not to be had under 1¾d. net. Sulphate of ammonia is, if anything, slightly weaker; but it should be recognized that this is entirely due to the action of operators for the fall—the demand having been good and stocks low in all directions. The price on Beckton terms is from £12 10s. to £12 12s. 6d. for delivery to the end of the year.

Sulphate of Ammonia. LIVERPOOL, *July* 15.

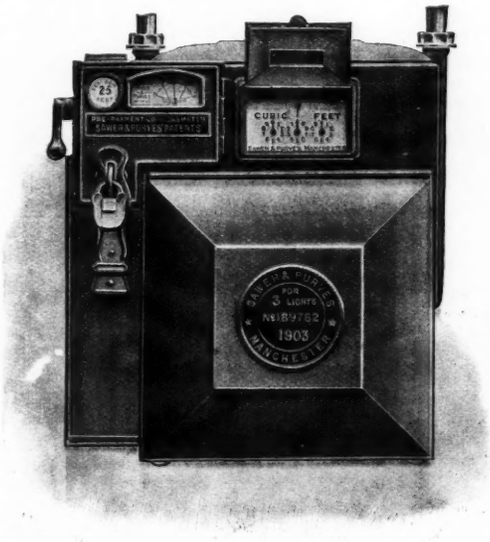
There has been no recovery from the weakness manifested in the market during the past few weeks; makers being anxious to market their output as it becomes available, while direct buyers for the most part remain indifferent. The bulk of the buying has, in fact, been mostly for covering sales made in advance, and, as this interest is in no hurry, prices are again the turn easier. The closing quotations are £12 6s. 3d. per ton f.o.b. Hull, and £12 7s. 6d. to £12 10s. per ton f.o.b. Leith and Liverpool. There continues to be inquiry in the forward position, but there is still a margin of 2s. 6d. to 5s. per ton between the views of makers and those of buyers; and any business taken abroad has been taken speculatively.

Nitrate of Soda.

This article is weak at 10s. 4½d. to 10s. 7½d. per cwt., according to quality, on spot; while for spring delivery there are speculative sellers of ordinary quality at about 10s. per cwt.

Tar Products. LONDON, *July* 15.

There has been a fairly good inquiry during the past week, although there has not been much actual business done. The demand for 90 per cent. benzol still continues very strong, an offer of 9½d. having been declined for forward delivery; while as regards prompt, makers here seem fully sold. Sales are reported in the North of England at



The "Positive"

SAWER & PURVES
MANCHESTER &
NOTTINGHAM.

9d. for early shipment; but makers decline to accept this price for forward delivery. There has certainly been more inquiry from the Continent during the past week, and any parcels offering for early delivery find a ready sale. In 50-90 per cent., 8⅛d. may be taken as the market value, at which figure business is reported for August-December delivery both for home consumption and for export. There is still a good inquiry for toluol; but there is really practically nothing offering for prompt delivery, while makers do not care to sell forward. Solvent naphtha remains in precisely the same position. There seems to be a fairly good business doing for home consumption at 8d. for ordinary 90 per cent. at 160° July-September delivery; while for special qualities 8⅛d. and even 9d. is reported to have been paid in more than one instance. There is no change in anthracene, although it is reported that one or two small parcels of 35-40 per cent. have been placed during the past week at from 1½d. to 1⅝d. per unit. Carbolic acid continues quiet, and Continental consumers decline to pay more than 1s. 9d. for 60's, and will only purchase for August-October delivery. Makers, however, seem fairly independent of the market, and ask 1s. 10d. for forward delivery. In crystals, the German makers report having done a fairly large business in 39-40 per cent. at 6¼d. for July-August shipment, and the demand continues good, but principally for prompt delivery. So far as London is concerned, creosote prices remain particularly firm, doubtless owing to the fact that very heavy shipments to America will be made in bulk during the present month. In Yorkshire, sales have been made at 1⅝d. for prompt; while in one instance 1¼d. was accepted for early shipment. As regards the Liverpool and Manchester districts, there is not very much business doing, and so the market continues quiet. Pitch is very dull, which is not unusual at this time of year; but sales are reported to have taken place, both in Belgium and in South Wales, at very low prices for delivery over the last six months of the present year. There has certainly been a fairly good inquiry both from Swansea and Cardiff; but prices offered by consumers are very low, and certainly under makers' ideas of value. So far as the east coast is concerned, makers appear fairly well sold; and there is not at present anything in the market for early delivery. It is, however, probable that in the course of a month or two, when some of the large tar contracts have been arranged, we may see more offering in the Yorkshire district. In Lancashire, there are several small parcels still available for early shipment; but dealers do not appear at all anxious to purchase them. Doubtless the very hot weather which at present prevails has a good deal to do with this.

The average values during the week were: Tar, 16s. to 21s. 6d. Pitch, London, 28s. 6d. to 29s.; east coast, 28s. to 28s. 6d.; west coast, 26s. 6d. to 27s. 6d. Benzol, 90 per cent., 9½d.; 50-90 per cent., 8½d. Toluol, 8½d. Crude naphtha, 3¼d.; solvent naphtha, 8¼d. to 8½d.; heavy naphtha, 10d. to 10½d. Creosote, London, 1 15/16d. to 1⅝d.; North, 1¼d. to 1⅜d. Heavy oils, 2d. to 2 1/16d. Carbolic acid, 60 per cent., 1s. 9d. to 1s. 9½d. Refined naphthalene, £4 to £8 10s.; salts, 12s. 6d. to 14s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has been very quiet during the past week, and there is scarcely any business reported. Beckton still quote £12 12s. 6d. for July, but have not been able to arrange business at this price; the actual value not being considered as more than £12 10s. The South Metropolitan Gas Company are quoting £12 12s. 6d. on their own special terms. Buyers, however, will not pay this figure at present. In Hull, the market is very quiet for prompt delivery. Some small parcels have been sold at £12 7s. 6d.; but business has been done forward at under this figure. The market at Leith continues quiet, and business has been done during the last few days at £12 7s. 6d. by dealers, although makers still ask £12 10s. for July-August shipment. At Liverpool, the market is quiet, and there is scarcely any business to report. The nominal price may be taken as £12 10s. for early shipment.

COAL TRADE REPORTS.

Lancashire Coal Trade.

A state of stagnancy describes the house coal trade of the county. In steam and engine fuel, trade continues brisk. Slack is getting scarcer and dearer. Coal for shipping is rather quiet. Many of the collieries are only working three and four days per week, and some even less. The average quotations are as follows: Best house coal 13s. to 14s. per ton at the pit, secondary 12s. to 13s., common 9s. to 10s., and even lower for inferior qualities, steam and forge coal 8s. to 9s., engine fuel 7s. 6d. to 8s. 6d., best slack 7s. 6d. to 8s., medium 6s. to 7s., common 5s. to 5s. 9d. Screened and unscreened coal for shipping varies from 9s. to 10s.

Northern Coal Trade.

There is a fairly good demand in the coal trade, though for some kinds this is the season of limited consumption—this time of the year necessarily interfering with the use of some classes. Steam coals, however, are largely exported. Best Northumbrian steams are 9s. 4½d. per ton f.o.b., second-class steams are 8s. 3d. to 8s. 6d., and steam smalls are very firm at from 4s. 9d. to 5s. 9d. Slight change is noticeable in the gas coal trade; but there is a little increase in the deliveries, which will show more fully in a week or two. Prices of Durham gas coals vary from 7s. 9d. to 8s. 3d. per ton f.o.b., according to quality. No large contracts are yet settled; but one for Italy for 20,000 tons of Durham gas coal is in the market, and is expected to be renewed at something like the current prices. Coke is firm, and gas coke is steady at the seaports; but at some of the inland gas-works the price is weaker, though the output is now at its lowest.

Scotch Coal Trade.

There is a little more activity, which is attributed more to the imminence of the holidays than to any other cause. The extra demand

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ltd.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND IN ADDITION, 7,900,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

has not, however, been sufficient to anything like work off the accumulated stocks. There is, consequently, no advance in prices. The quotations are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. to 8s. 9d., and splint 8s. 3d. to 8s. 6d. The shipments for the week amounted to 265,463 tons—an increase of 28,503 tons upon the preceding week, and of 36,441 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,163,172 tons—an increase of 314,780 tons upon the same period of 1904.

Stimulating Gas Consumption at Tiverton.—At the meeting of the Tiverton Town Council on Monday last week, the Lighting Committee reported that, as the result of inquiries made of persons using gas for cooking purposes through slot meters, as to whether they would be willing to use gas for lighting through the same meters if the Council provided and fixed brackets free of charge, answers had been received asking for 222 burners, the cost of which would be £75 to £80. These extra burners would increase the output of gas by about 1,205,000 cubic feet per annum, equal to a revenue of £200; and, with the approval of the Council, the Committee proposed to advertise for tenders for providing and fixing the brackets. Mr. J. Thorne moved the adoption of the report, and said he thought the Council would feel that the Committee were justified in instituting the new arrangement. The work of putting meters and stoves in houses had already been carried out; but probably two-thirds of the occupants used gas for cooking only during the summer months, and in the winter it was not employed. The introduction of brackets and burners would encourage the use of gas for lighting purposes. The report was adopted.

Gas v. Electricity: Figures from Southend.—The following letter, written by a consumer to the Southend Gas Company, on the subject of the relative cost of gas and electricity, has appeared in the Press: "I should like to express my complete satisfaction with the lamps supplied by the Southend Gas Company, and bring to your notice the marked difference between the cost of electric light and gas, when consumed scientifically. My last corresponding quarter [April to June, 1904], when I had my premises illuminated by electric light, was £13 13s. 2d. (this is after deducting the 5 per cent. discount); the cost of consumption of gas during this quarter is only £4 15s. 1d.—not much more than one-third, although I have much more light and an extra shop consuming the gas. If I had had my premises lit by gas instead of electric light since I have been in business in Southend, I estimate I should have saved quite £65 difference of consumption, besides having a much better light and less trouble." It is stated that the consumer in question commenced business in the Southend district in March, 1904; and his electric light accounts for the twelve months ended March this year totalled £108. The charge for current is only 1½d. per unit after a certain consumption has been reached; and yet for the quarter ended March last the consumer's bill was about three times greater than if he had been using gas. The price of gas in Southend is 3s. 6d. per 1000 cubic feet.

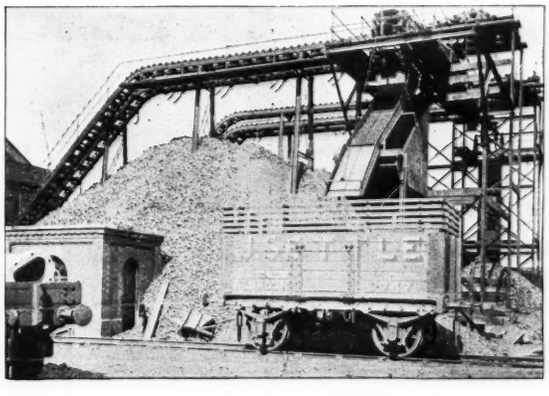
Liversedge Water Supply.—Recently complaints have been made in Liversedge with regard to the water supplied to the inhabitants by the Bradford Corporation; and Mr. James Watson, the Bradford Water-Works Engineer, has now prepared a full report on the subject. He points out that comparison of the charges made by a central authority and those made by small urban district councils, if applied to Bradford and Liversedge, would show that the amalgamation made in 1893 with the Bradford Corporation has saved the people of Liversedge many thousands of pounds in water rates and charges, and in addition has secured to them for all time a supply of water in point of quality most excellent, and in quantity ample and sufficient for all purposes of comfort, cleanliness, and health, in place of their former stinted supply, which was (during the administration of the Local Authority), according to all well-informed opinion on sanitation and public health, utterly inadequate. In addition to maintenance and management, the works undertaken by the Corporation in direct connection with the Liversedge supply have cost £30,000. The Corporation part of the work necessary to afford supply under pressure (replacing the 2-inch pipes by 4-inch ones) is now practically completed; and Mr. Watson says that attention should now be directed to the duty of the owners of property there to make the necessary provision in their own pipes and fittings to ensure to themselves and their tenants a constant and abundant supply.

East Surrey Water Company.—At the recent annual general meeting of this Company, the Directors reported an addition of 747 customers during the year ending the 25th of March, and an extension of the mains by 15 miles, including a high-service main between the Purley works and the Caterham reservoir. The profit for the year was £25,075, which was brought up to £26,877 with the balance carried forward. Out of this sum £2000 had been placed to the renewal and contingency fund, and interim dividends at the rates of 5, 10, and 7 per cent. per annum paid upon the preference and ordinary shares. The Directors recommended the payment of final dividends at these rates, which would leave a balance of £1921. The Chairman (Mr. P. Riddoch), in moving the adoption of the report, remarked that the additional consumers were 70 more than those which came upon the books in the preceding year; and the income was £37,889, against £35,000. Of course, there was a normal increase in the working expenses. Besides paying the maximum dividends, they were able to put £2000 to the renewal and contingency fund. They had debited this account with £975 which had been spent chiefly on keeping the works in a thorough state of repair and quite up to date. This year they were engaged in preparing plans involving an outlay of £20,000, which would be spent chiefly on providing additional storage capacity at Alderstead. The Deputy-Chairman (Sir Myles Fenton) seconded the motion; and it was carried unanimously. Reference was made to the retirement of Mr. Downes, and the appointment of Mr. A. E. Cornewall-Walker, Assoc.M.Inst.C.E., to succeed him as Engineer, Manager, and Secretary (Mr. Downes being made Consulting Director); and the dividends recommended were declared.

A NOVELTY!

HOT COKE CONVEYORS.

Archd. Little's Patent HOT and COLD COKE CONVEYORS fitted with



W. T. Holland's Patent DUST PROOF ROLLERS AND BRACKETS, The "KEYSTONE" Patent, on Conveyors.

On the above Installation Coke is taken from Retorts and put into stock or direct (over screens) into waggons. The Conveyors **AUTOMATICALLY PICK UP FROM STOCK** and discharge into waggons when desired.

SOLE MAKERS:

NEW CONVEYOR CO., LTD., SMETHWICK, BIRMINGHAM.

Another Water Famine Threatened at Cork.—The water supply of Cork at the present time appears to be a very precarious one. Some weeks ago there was a breakdown of the machinery, which threatened to cause a water famine. A timely rainfall, together with the loan of a fire-engine by Dublin, warded off the catastrophe; but the latest news is to the effect that the fire-engine has broken down, and the works machinery now running is unequal to the emergency. A steady decrease is therefore taking place in the quantity of water in store. An important factor in the situation is the shallow state of the water in the river, which has altogether thrown the turbines out of use.

Boston (Lincs.) Gas Company.—The report submitted at the annual meeting of the Boston (Lincs.) Gas Company stated that the net profits for the year amounted to £3031. The balance to the credit of the profit and loss account, after paying the interim dividend in February, was £8012, out of which the Directors recommended the payment of the remainder of the full parliamentary dividend on both classes of shares, which would absorb £1306, and leave a balance to be carried forward to next year's account of £6705. Owing to the reduced price of coal and the large increase in the consumption of gas, the Board were able to announce a reduction in the net price from 3s. 6d. to 3s. 2d. per 1000 cubic feet as from Nov. 1 last; and since then the demand for gas had increased. Dividends were declared at the rates of 8½ per cent. on the ordinary shares and 7 per cent. on the new ordinary shares.

Reference has been made on various occasions to the brick-making machinery in use at the Leeds and Plymouth Gas-Works. We learn that the makers (Messrs. W. Johnson and Sons, of Armley) have had contracts in hand for it. They have also secured a contract for briquette-making machinery for the Montreal Gas-Works, as the result of a stand at the St. Louis Exhibition.

The Cwmbran and Pontnewydd Gas Company, who recently advertised in the "JOURNAL" for competitive designs and tenders for a new gasholder and steel tank, have placed the contract in the hands of Messrs. Willey and Co., Limited, of Exeter. The work will be carried out under the superintendence of the Gas Company's Engineer, Mr. T. H. White, since whose appointment the undertaking has made rapid strides.

Some little inconvenience was caused in Bradford Street, Birmingham, early last Tuesday morning by the bursting of a 12-inch water-main, at a spot where workmen were engaged in shifting a temporary tram-track from one side of the road to the other. Not more than about an hour elapsed before the rush of water was stopped; but a good many cellars in the neighbourhood had meanwhile been flooded. This, however, was the extent of the damage occasioned.

Last Tuesday afternoon, an exhibition of gas-stoves and appliances was opened at Ventnor by Mr. W. H. Littlefield, the Chairman of the Ventnor Gas and Water Company. The stoves shown were the "Metropolitan" cookers of the Davis Gas-Stove Company, Limited; and an interesting feature of the other appliances was a self-lighter for gas. The Company's Manager (Mr. J. S. Ineson), in a short address to the audience, in which were a large number of ladies, called attention to the advantages of gas, and showed how it could be readily brought into use by the self-lighting arrangement, which would enable them to switch on a 60-candle light at the cost of ½d. per hour. Mr. Littlefield, in declaring the exhibition open, expressed his pleasure at seeing so numerous an attendance. He then introduced Mrs. Collins, who gave the first of a series of demonstrations in cookery, which were continued every afternoon and evening till Friday, and were largely attended.

In opening recently in Birkenhead an exhibition of Richmond gas-cookers, promoted by the Corporation, Alderman Bloor, the Chairman of the Gas and Water Committee, remarked that many years ago a gas exhibition was held at the Crystal Palace, which was visited by a deputation from the Birkenhead Corporation. On their return, it was recommended that the Corporation should hire out stoves; and the proposal was adopted. The first stove was fixed in 1883; and now, to the knowledge of the Committee, there were 3753 large cooking-stoves and 8500 small ones in use in Birkenhead. The Corporation had three ways of dealing with these stoves—simple hire, hire-purchase, and sale outright. To guard the Corporation against any charge of undue preference, he stated that the Company demonstrating that evening had been chosen simply because the Committee believed them capable of supplying anything and everything connected with the consumption of gas; and it was in the consumption of gas that the Corporation were interested. Lectures on cookery were delivered by Miss Tuxford.

WANTED, FOR SALE, CONTRACT, &c. ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

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TRAVELLERS. No. 4427.
WORKING MANAGER. No. 4431.

Pupil Required. No. 4434.

Situations Wanted.

MANAGER OR ASSISTANT. No. 4433.
SECRETARY AND MANAGER. No. 4426.
WORKING FOREMAN. Watson, Hele, Torquay.

Exhibition. Application for space to Newcastle-on-Tyne Gas Company.

Company Meeting.

SOUTH METROPOLITAN GAS COMPANY. Cannon Street Hotel. Aug. 9. Two o'clock.

Stocks and Shares.

NEWCASTLE AND GATESHEAD GAS COMPANY. July 31.
WHITBY GAS COMPANY. Aug. 14.

TENDERS FOR

Coal and Cannel.

HAWORTH GAS DEPARTMENT. Tenders by July 26.
LIMERICK GAS DEPARTMENT. Tenders by Aug. 5.

Meters.

BELFAST GAS DEPARTMENT. Tenders by Aug. 3.

Tar and Liquor.

EASTBOURNE GAS COMPANY. Tenders by July 27.
OSWALDTWISTLE GAS DEPARTMENT. Tenders by Aug. 1.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

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GAS PURIFICATION & CHEMICAL CO., LD.
JOHN WM. O'NEILL,
Managing Director,
PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
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BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
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Telephone: 341, AVENUE.

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Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
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PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
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BROTHERTON AND Co., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

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Illustrated sheets on application.
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Best Prices paid.
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
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METHANE-HYDROGEN PLANT and SATURATORS — See Advt. in this week's issue.
EXHAUSTING MACHINERY—See Advt. in next week's issue.

WANTED, Re-Engagement as Working FOREMAN or Main and Service Layer, Gas-Fitter, &c. Total Abstainer. Excellent Testimonials.
G. WATSON, Orchard Cottages, Hele, TORQUAY.

WANTED, an Engagement as Secretary and Manager combined, or either separately. Advertiser has had many years practical experience in the management of a Water-Works undertaking, and is thoroughly conversant with both office and outdoor work, including Pumping, Filtration, Pipe Laying, &c., and also with Deacon's Waste-Water Meter System for the suppression of Waste. Testimonials, &c.
Address, in first instance, No. 4426, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NEWCASTLE-ON-TYNE GAS EXHIBITION.

(Under the Auspices of the NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY).

AN Exhibition of Gas Appliances for LIGHTING, HEATING, and POWER will be held in the Newcastle Exhibition Buildings, the largest Hall in Newcastle-upon-Tyne, from the 13th to the 27th of September next.

Applications for space for Exhibits of interest are invited.

The charges for space will be nominal and Gas wil be supplied at 2s. per 1000 cubic feet less 50 per cent. discount for prompt payment.

Prospectus and Forms of Application for space will be sent upon request to the JOINT MANAGERS, Newcastle-upon-Tyne Gas Exhibition, 43, Grainger Street, NEWCASTLE-UPON-TYNE.

WANTED, a Situation, by B.Sc. (in Engineering), as MANAGER or ASSISTANT of Gas-Works. Served Three Years Articles with Gas and Water Engineer. Four Years' University Technical Training. Diploma in Mechanical Engineering, and Honours Gas Manufacture.
Address No. 4433, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager for a small Country Gas-Works.
Apply, by letter, stating Wages required, Age, and Experience, with *copies* of Two recent Testimonials, to No. 4431, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TRAVELLERS wanted for Scotland, North of England, and the Midlands. Good men wanted. Preference given to those having previous Experience and a Connection among buyers of Gas-Meters in their respective districts.
Apply, by letter, to No. 4427, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GAS Engineer in the Midlands has a vacancy for a PUPIL who possesses some special aptitude for Engineering Work. Exceptional opportunity. Premium required. References given and required.
Address No. 4434, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A FIRST-CLASS opening is offered as REPRESENTATIVE of a large Firm in the Gas Coal trade, more particularly to take charge of the Continental branch of the business. To a really Energetic Man with Good Connection arrangements might be made for an eventual permanent share in any business introduced.
Address, in the strictest confidence, No. 4432, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, early in August, a thoroughly Reliable Man to act as RETORT-HOUSE FOREMAN. Night duty for the present, and alternate weeks in Winter. Applicants must have a first-class knowledge of Regenerative Settings, and be able to control Workmen. Wages to commence at 37s. 6d. per week.
Apply, stating Age and Experience, together with Testimonials, to W. B. REIDIE, Gas-Works, Barking, ESSEX.

TO BE SOLD, Four Lengths of New Steel Hydraulic Main, D-shaped, 18 in. by 18 in. by 9 ft. 6 in. long each, tops perforated for 6 Dip Pipes. Also 6-inch Ascension, Arch, and Dip Pipes to suit, ready for delivery.
Write the WRIGHT GAS PLANT MANUFACTURING COMPANY, LIMITED, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters. Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TENDERS FOR GAS COAL.

THE Gas Committee of Limerick invite TENDERS on or before the 5th of August for 8000 or 17,000 Tons of GAS COAL, according to Specification to be had on application at the Gas Offices, 34 and 35, William Street, LIMERICK.
July 5, 1905.

URBAN DISTRICT COUNCIL OF OSWALDTWISTLE.

TENDERS FOR TAR AND LIQUOR.

THE above Council invite Tenders for the TAR and LIQUOR to be produced at the Gas-Works for One Year from the 1st day of August, 1905.
The estimated quantity of Tar is 300 Tons, and that of Liquor 500 Tons.
Further Particulars may be obtained on application to the Manager, Mr. T. Loxley, at the Gas-Works, Church, near Accrington.
Sealed Tenders, endorsed "Tender for Tar and Liquor," must be sent to the undersigned on or before Tuesday, the 1st of August, 1905.
No Forms of Tender issued.
B. T. WESTWELL,
Clerk to the Council.
Town Hall, Oswaldtwistle,
July 17, 1905.

CITY AND COUNTY BOROUGH OF BELFAST.
(GAS DEPARTMENT.)

TENDERS are invited for the supply of Wet (compensating) and Dry METERS for One Year from the 1st of September, 1905.
Discounts allowed off Standard Price List only to be quoted.
Meters are to be delivered to our Stores in good order and carriage paid.
Tenders, endorsed "Tender for Meters," must be delivered at my Office not later than Thursday, the 3rd of August, 1905.
The lowest or any Tender not necessarily accepted.
SAMUEL BLACK,
Town Clerk.

TENDER FOR TAR.

THE Eastbourne Gas Company invite TENDERS for the purchase of surplus TAR produced from July 1, 1905, during the ensuing Year.
The Tar will be f.o.r. at Eastbourne in Contractor's Tanks (working particulars of Mr. John Hammond, the Resident Engineer and Manager).
The Directors are prepared to make the Contract upon the Sliding-Scale basis or otherwise.
Sealed Tenders, addressed to the Chairman of the Company, endorsed "Tender for Tar," will be received up to Thursday, July 27 inst.
JAMES S. GARRARD,
Secretary.

THE Haworth Urban District Council are prepared to receive TENDERS for the supply of 2400 Tons of GAS COAL (screened, unscreened, and Gas Nuts) delivered at the Haworth Station during the ensuing Twelve Months.
Sealed Tenders, endorsed "Gas Coal Tender," to be forwarded to me, the undersigned, not later than the 26th inst.
No special Form of Tender.
WILLIAM ROBERTSHAW,
Clerk to the Council.
1, Burlington Chambers,
North Street, Keighley.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Cannon Street Hotel, in the City of London, on Wednesday, the 9th day of August next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June last; and to declare a Dividend for the same period.
Notice is Hereby also Given, that at such Meeting the Directors will submit a Resolution to the Proprietors for authority to raise £250,000 further Capital by the creation and issue of Ordinary Stock and Debenture Stock pursuant to the powers contained in the Company's Act of 1901. This Stock will be raised from time to time as required.
The TRANSFER BOOKS WILL BE CLOSED from the 26th day of July inst., until after the Meeting.
By order,
FRANK BUSH,
Secretary.
Offices: 709, Old Kent Road, S.E.,
July 15, 1905.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF £60,000 ORDINARY STOCK.

THE Directors offer for Sale by Tender £60,000 ORDINARY STOCK, to be issued under the provisions of the Newcastle-upon-Tyne and Gateshead Gas Act, 1901. Applications receivable up to Ten a.m. on the 31st of July, 1905.
When gas is charged at the present rate of 2s. per 1000 cubic feet, the Authorized Dividend is £4 12s. 6d. per cent.
Any amount of Stock, being not less than £5, or a multiple thereof, may be applied for. A deposit of 5 per cent. on the nominal amount of Stock applied for must accompany each Tender, and the balance be paid on or before the 30th of September, 1905. Interest at the rate of 4½ per cent. per annum will be allowed upon prepayments.
Minimum Price, £105 per cent.
The Company's profit for the year 1904 was £113,354; and after paying all interest and full statutory dividends, there was left a surplus profit of £21,530.
The gas sold in 1904 was 2813 Million Cubic Feet; and the number of Consumers 71,629—being an increase of 83 Millions and 8301 respectively over the previous year.
Prospectuses and Forms of Tender will be sent on application to the undersigned.
THOS. WADDOM,
Secretary.
Newcastle-upon-Tyne,
July 11, 1905.

WHITBY GAS COMPANY.

SALE BY TENDER OF 300 NEW ORDINARY SHARES.

NOTICE is Hereby Given, that it is the intention of the Directors of the Whitby Gas Company to SELL by TENDER, to be received at the Company's Office, Baxtergate, Whitby, not later than the 14th day of August, 1905,
THREE HUNDRED NEW ORDINARY SHARES of Ten Pounds each.
The Shares now for sale constitute a first issue of Additional Capital, which will be issued in accordance with the provisions of the Whitby Gas Act, 1904.
Any number of shares (not exceeding ten in each single lot) may be applied for. The Shares will be allotted to the highest Tenderers, at and above the reserve price.
Particulars and Conditions, with Forms of Tender, can be obtained from the undersigned.
WM. M. GALLEWAY,
Secretary.
Gas Office, Whitby, July 7, 1905.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

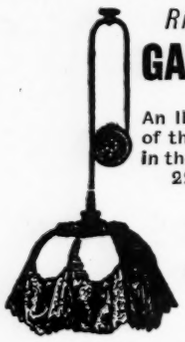
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

THE "HANWELL" PATENT
Rising and Falling
GAS PENDANT



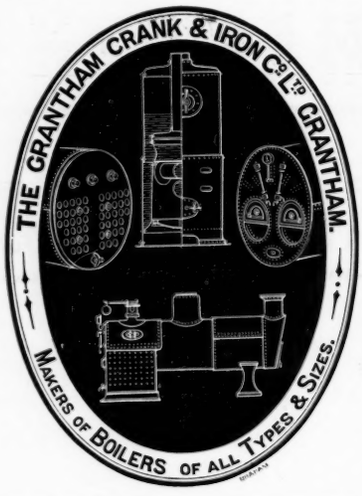
An Illustrated Description of this Pendant appeared in the "Journal" for Nov. 22, 1904 (page 599).

Write for full Particulars to the
"HANWELL" Pendant Company,
96, ABINGTON STREET, NORTHAMPTON.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.



Gas Companies are solicited to try Samples of the
MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

Prices and analysis on application.

The MIRFIELD (GAS-COAL) COLLIERIES CO.,
RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JOHN HALL & CO.,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

S. S. STOTT & CO.,
ENGINEERS,
HASLINGDEN, nr. MANCHESTER.

LIME & OXIDE ELEVATORS & CONVEYORS.
COAL AND COKE STORAGE PLANTS.
Coal and Coke Elevators and Conveyors.
STAMPED AND RIVETTED STEEL ELEVATOR BUCKETS.
DETACHABLE CHAINS AND SPROCKET WHEELS.
HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

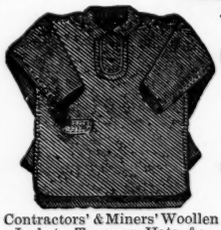
Registered Offices
Adjoining Lye Station, G.W. Railway.
Telegrams:
"Harrison, Lye.

GEORGE K. HARRISON, LIMITED,
Proprietors of
STOURBRIDGE FIRE-CLAY MINES,
BRICK WORKS, & COLLIERIES,
STOURBRIDGE.

Works, Collieries, and Mines:
BRETTELL LANE, NAGERSFIELD, and LYE.

THOMAS BUGDEN,
India Rubber, Cuttapercha, Air-proof, and . . Waterproof Manufacturer.

All Seams Stitched and Taped.
ORIGINAL MAKER OF
GAS BAGS FOR MAINS,
Round or Cylinder shape.



Diving and Wading Dresses, Gas Engine Bags, Sewer Boots, Tar Hose, Leather Machine Bands. Stokers' Mitts, Bellows, &c.

Contractors' & Miners' Woollen Jackets, Trousers, Hats, &c.
Sewer & Fireman's Boots.
116 & 118, GOSWELL RD., LONDON.

TIMMIS'S PATENT
CLINKERING DOOR.

For Illustrated Advertisement, with full Particulars, see "JOURNAL" for April 4, p. 66.

GEO. H. TIMMIS,
River Stour Works, STOURBRIDGE.
Telegrams: "TIMMIS, LYE." National Telephone: 13, LYE.
or of HARPER & MOORES, LTD.,
STOURBRIDGE.

Why have your Carburetted Water-Gas Plants Idle?

IMPORTANT TO GAS ENGINEERS.

THE METHANE-HYDROGEN GENERATOR

CAN BE ADAPTED TO ANY MAKE OF

Carburetted Water-Gas Plant.

UTILIZING OIL GAS TAR.

REDUCING THE OIL ACCOUNT BY 25 PER CENT.,

WITH A

Reduction of Carbon Monoxide and an Increase of Hydrogen and Methane, enabling a larger percentage of this Gas being used.

RESULTS GUARANTEED.

Enquiries Solicited.

BIGGS, WALL, & CO.,

GAS ENGINEERS,

13, CROSS STREET, FINSBURY, LONDON.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: H. CRESSWELL & Co., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

GILBERT LITTLE & CO. LTD.

Conveyor and Elevator Specialists,
Smethwick, Birmingham.

Make known your wants for Conveyors and Elevators to GILBERT LITTLE, the Pioneer Specialist: he will supply them.

THE
"ROTARY"
STATION METER.

Efficiency Demonstrated.

APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

'BUFFALO' INJECTOR

Operated Entirely by One Handle

Class A lifts 24 ft.
Class B lifts 12 ft.

SEND FOR LIST.

Telegrams: "Temperature London." Tel. No. 12,455 Central.

GREEN & BOULDING,
— LIMITED, —
28, New Bridge St., LONDON, E.C.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

THE LEEDS FIRECLAY CO., LTD.,

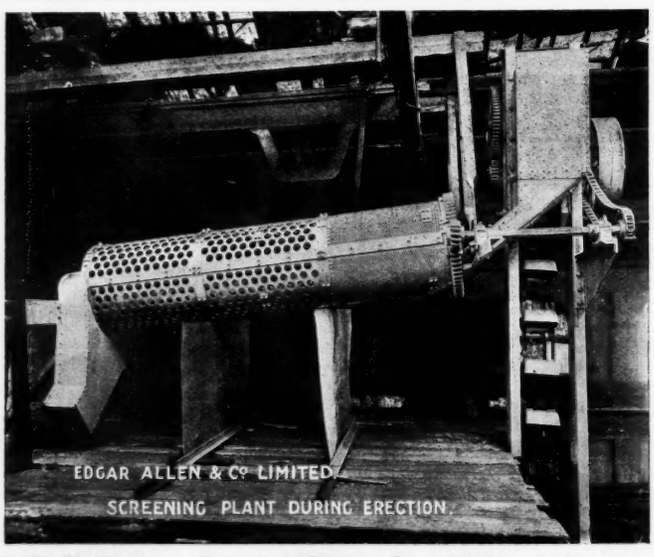
CLIFF'S BRAND.
INGHAM'S BRAND.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

Patent MACHINE-MADE RETORTS

These Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made. *Retorts carefully Packed for Export.*

LONDON: 2 & 3, NORFOLK STREET, STRAND, W.C.
LEEDS: 20, Park Row. LIVERPOOL: 21, Leeds Street.



PULVERIZING,
GRINDING,
SEPARATING,
STORING,
WASHING AND DRYING MACHINERY,
For all Classes of Material.

Coal & Coke Handling Plants.

TOOL STEEL, FILES, &c.

COAL & CANNEL BREAKERS.

EDGAR ALLEN & CO., LD., IMPERIAL STEEL WORKS, SHEFFIELD.

WELSBACH LIGHT

(PATENTED)

Fig. 35. 100 c.p.

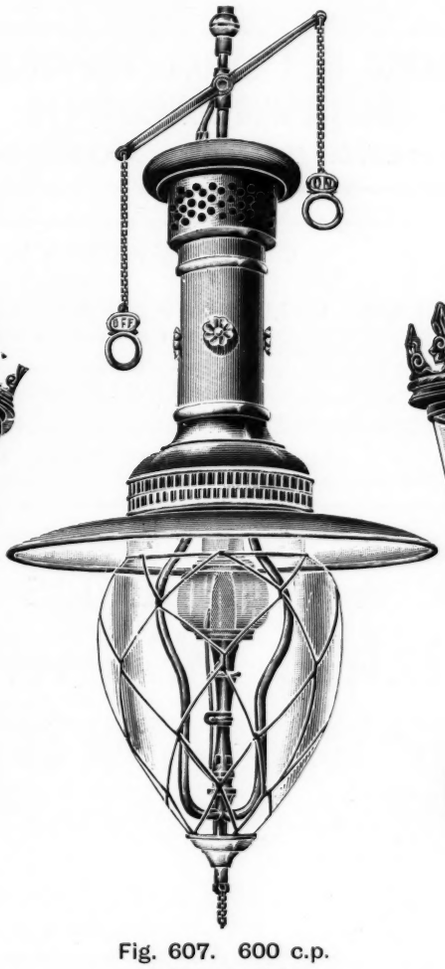


Fig. 607. 600 c.p.
Self-Intensifying.

Fig. 35a. 300 c.p.
Self-Intensifying.

SPECIALLY LOW PRICES
TO LIGHTING AUTHORITIES.

Thousands of the above Lamps in use and giving satisfaction.

EVERY LAMP GUARANTEED.

THE

WELSBACH INCANDESCENT GASLIGHT CO.

LIMITED,

2 to 14, Palmer Street, WESTMINSTER, S.W.

Telegrams: "WELSBACH, LONDON." *Telephone: 290 WEST.*

HONE'S PATENT GRABS

Automatic, Efficient, & Economical.

APPLICABLE TO ANY ORDINARY SINGLE CHAIN CRANE.

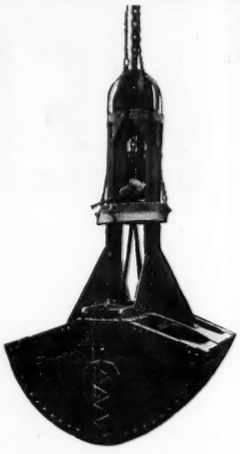
These Grabs are unequalled for handling Coal, Coke, Ballast, Sand, Macadam, Ores, &c., effecting in all cases very substantial savings.

Used by all the Principal Gas Companies, Colliery Owners, Coal Merchants, Engineers, Contractors, &c., at Home and Abroad.

Applications for Prices and Particulars are invited by the Sole Manufacturer—

THE THAMES IRON WORKS, SHIPBUILDING, and ENGINEERING COMPANY, LTD.,

CANNING TOWN, LONDON, E.



GAS METERS.
SLOT METERS.
GEYSERS.
COOKERS.
STOVES.
WORKSHOP LAMPS.
GAS IRONS.
IND. GAS APPLIANCES.
FITTINGS.

CENTRAL WORKS in DESSAU
OF THE
GERMAN CONTINENTAL GAS ASSOCIATION
(Deutsche Continental Gas Gesellschaft).

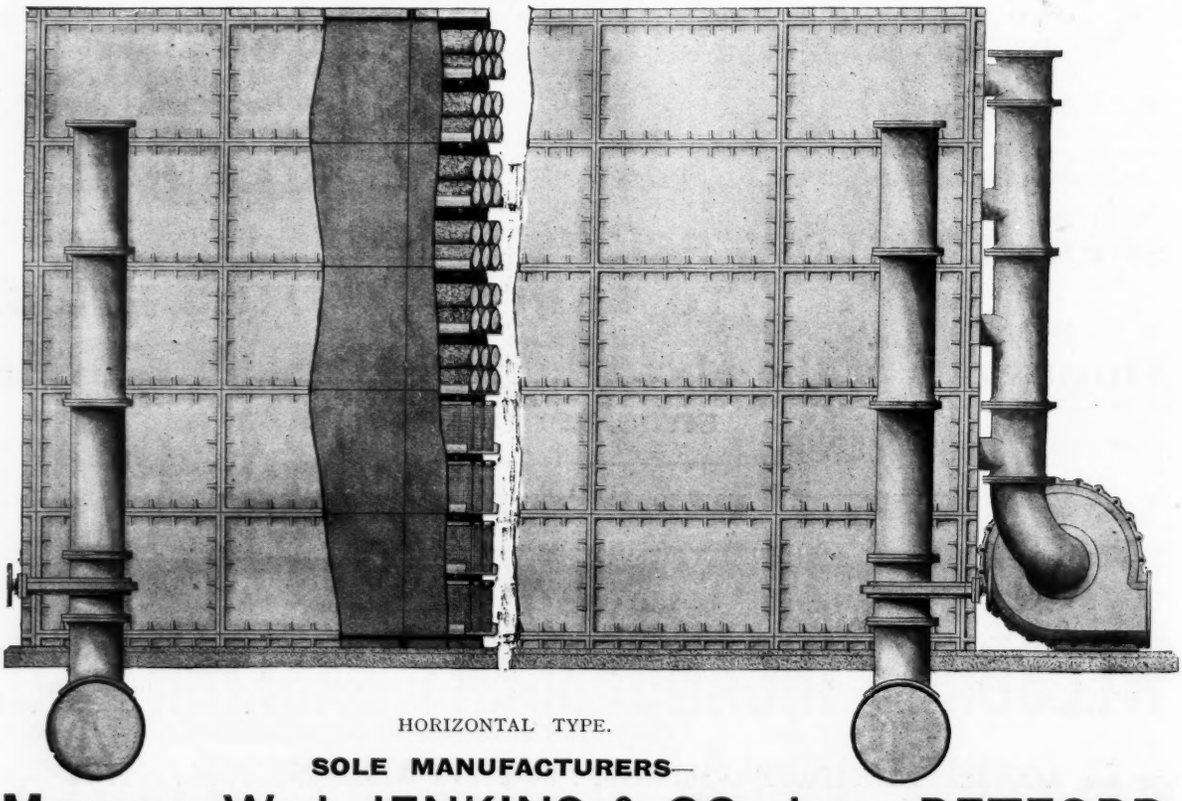
For Illustrated Price Lists and full Particulars apply to our SOLE AGENTS FOR THE UNITED KINGDOM AND COLONIES:

THE INCANDESCENT LIGHTING & MANTLE INSURANCE CO.,
57/58, CHANCERY LANE, LONDON, W.C.
Telephone: 12788 CENTRAL. Telegrams: "FRAENKL, 58, CHANCERY LANE."

BROWNE & CHANDLER'S PATENT

Vaporizing Condensers.

In these Air Condensers a greatly increased efficiency is secured by Internal Evaporation of a comparatively trifling quantity of water, with or without Fan draught.



HORIZONTAL TYPE.

SOLE MANUFACTURERS—

MESSRS. W. J. JENKINS & CO., LTD., RETFORD.

Are you in

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MOFFAT'S LIMITED,
155, FARRINGDON ROAD, E.C.

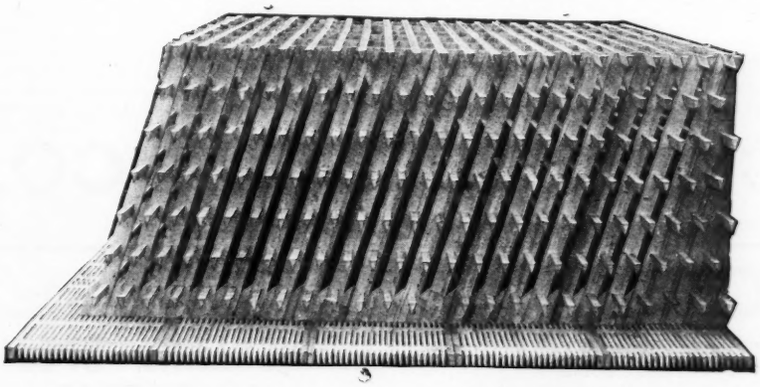
SPENCER'S PATENT HURDLE GRID

The very best Patent Grid on the Market for Holding Oxide Lightly,

And Holding Oxide Lightly is the Secret of Success for Better Purification.

No Extra Cost in adopting this system to existing Purifiers.

They are Self-Supporting, saving the cost of Standards and Bearers.



Can make the Change from the Old to the New System without any Stoppage.

Simple in Construction and very easy to fix in Position.

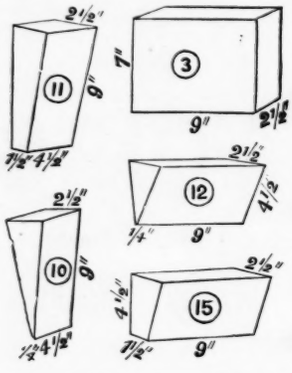
THE ADVANTAGES WITH SPENCER'S PATENT HURDLE GRID:

1—They more than Double the Purifying Area of a given Purifier.
2—They can be filled in half the time as on any other Patent system.
3—Purifiers run much longer, Back pressure greatly reduced.
4—Purification much Improved at 25 per cent. less cost than by any other Patent method.

P.S.—My Patent is no Infringement of any other Patents.

WALTER SPENCER, GRID WORKS, ELLAND.

STEPHENS & CO., KIDWELLY.



Contractors to a large number of the Principal Gas-Works.

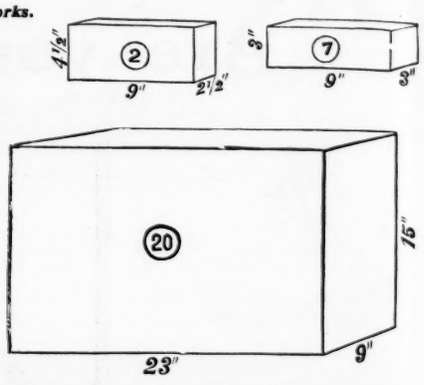
SPECIAL IMPROVED

SILICA BRICKS, BLOCKS. SHIELDS, TILES.

SPECIAL PLASTIC SILICA CEMENT.

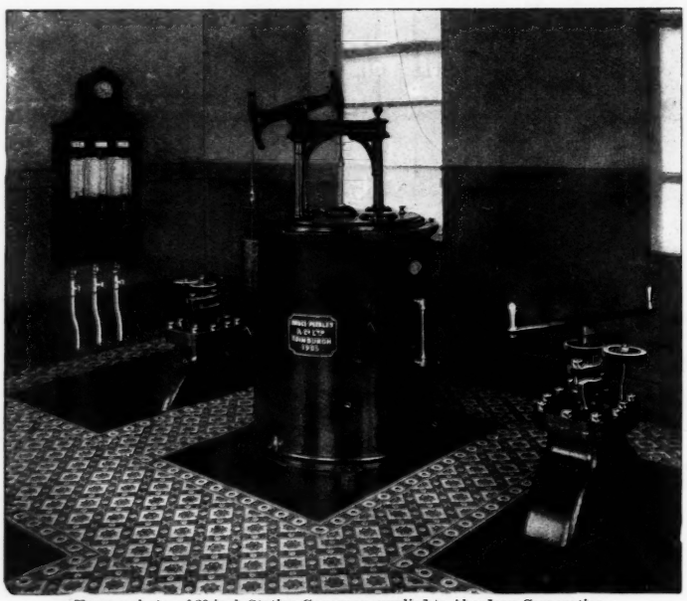
Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.

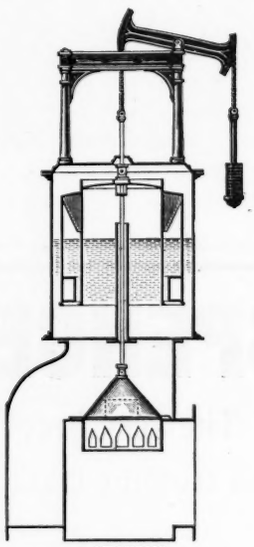


PATENT SAFETY STATION GOVERNORS.

The result of many years' varied experience in their design and manufacture, they effectually Control Pressure under the most exacting conditions.



From a photo. of 30-inch Station Governor supplied to Aberdeen Corporation.



SECTION.

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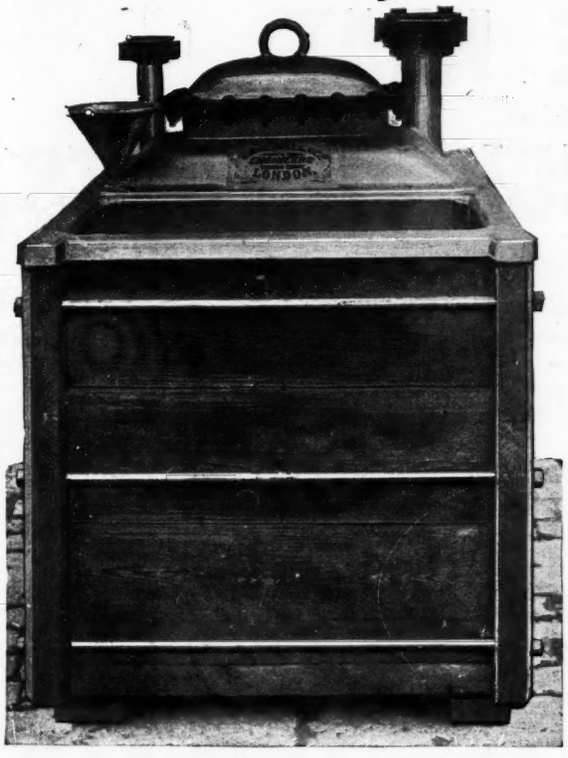

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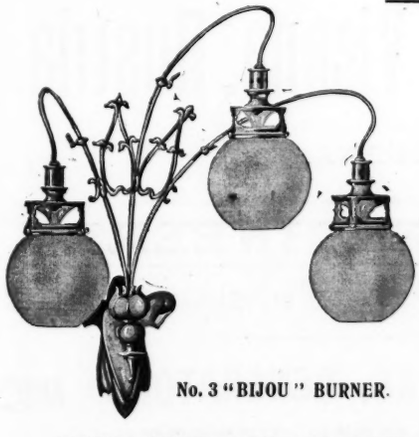

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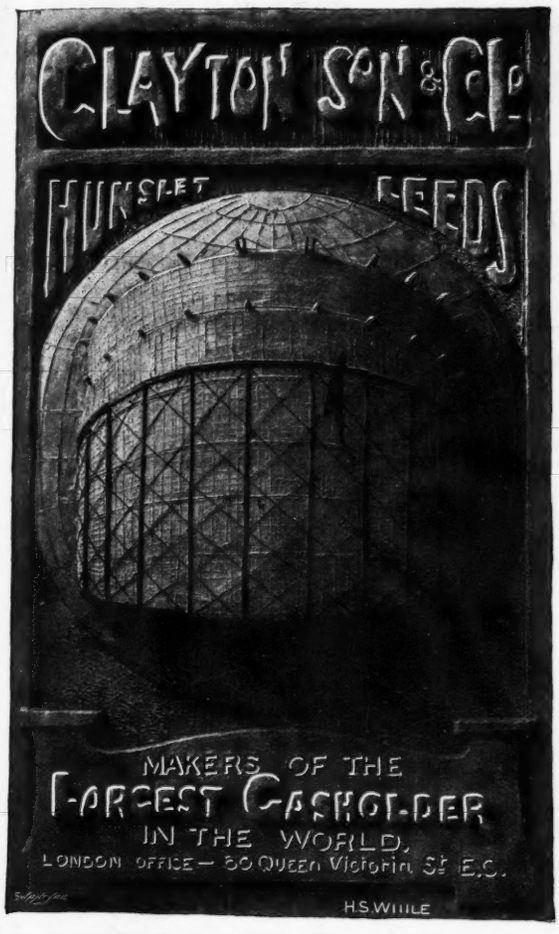

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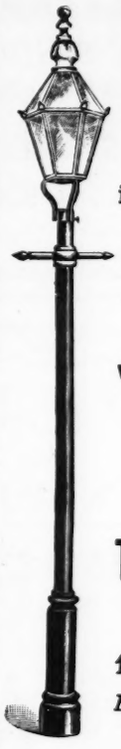

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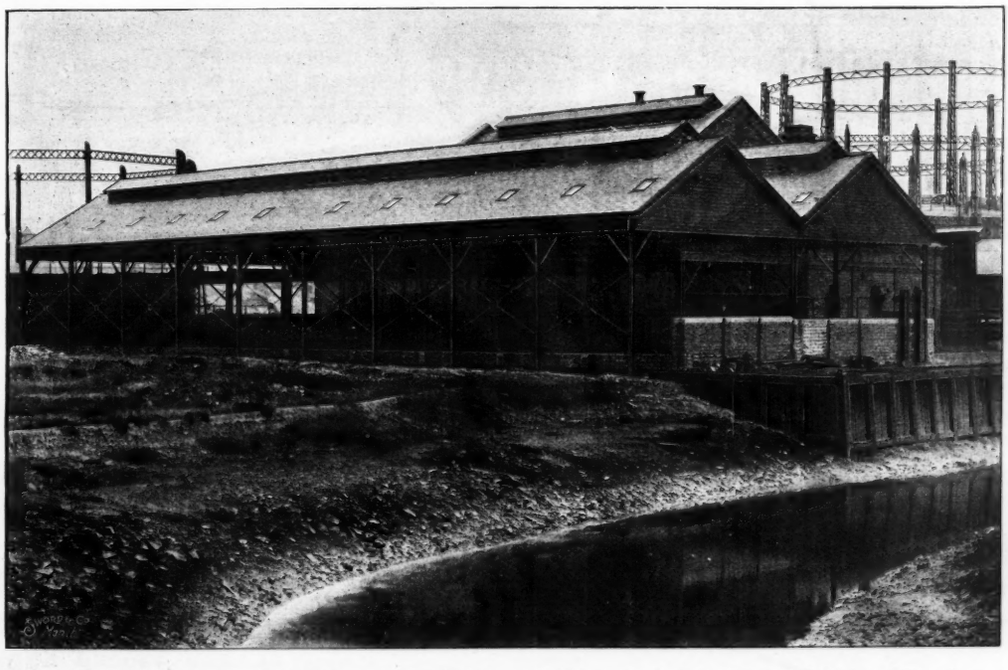

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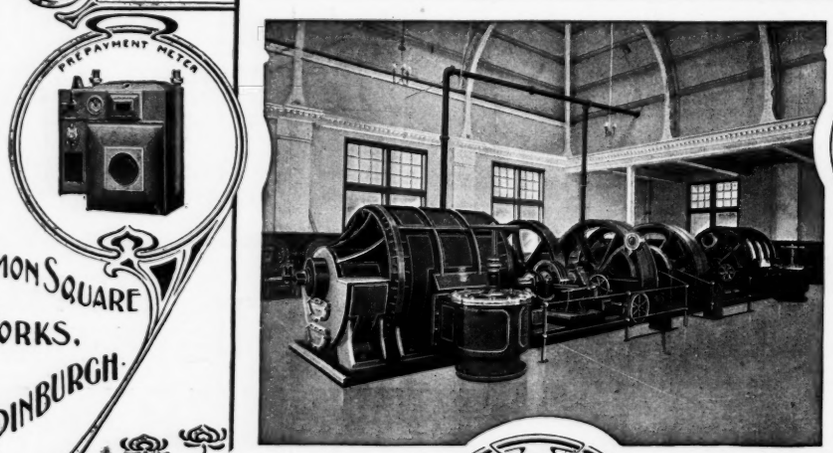

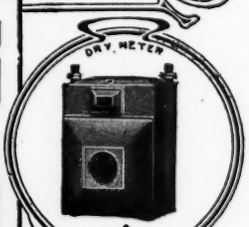

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